



# CHEMICAL ABSTRACTS

Vol. 17.

AUGUST 20, 1923

No. 16

## 1—APPARATUS

C. G. DERICK

**New plant control apparatus.** ANON. *Wärme & Kälte Tech.* 24, 257-61(1922).—The app. includes a flow meter for corrosive and dirty gases in which the pressure connections are kept full of air by means of a slow stream of compressed air. There is also a sp. gr. recorder for gases, which depends on the difference in hydrostatic head exerted by columns of the gas and of air.

ERNEST W. THIELE

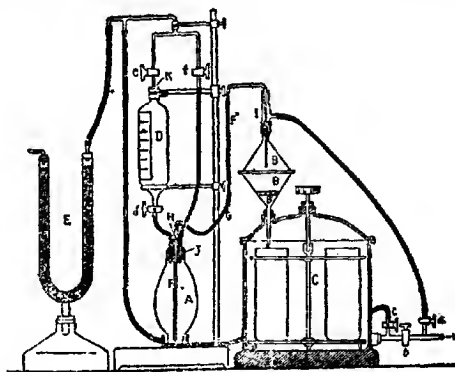
**Researches on thermostats.** A. TIAN. *J. chim. phys.* 20, 132-66(1923); cf. *C. A.* 16, 3774.—From an extensive examn. of the various regulation factors of a thermostat without a stirrer it is concluded that temp. fluctuation will be least when the temp. interval between make and break of the regulator circuit is very small and nearly equal to the difference between the max. and minimum temps. of the regulator. The mathematical theory of the performance of thermostats with 2 or 3 enclosures as well as directions for their construction are given. With such a thermostat even with a small Hg regulator a constancy of 0.001° for several hrs., and of 0.01° for several days is obtained.

BENJAMIN S. NEURAUSEN

**New heat and technical control measuring apparatus.** GUIDO WÜNSCHER. *Stahl u. Eisen* 43, 753-7(1923).—Descriptions and figures are given of various measuring devices used for detg. pressures, and flow of gases under diff. conditions around a plant, with a discussion as to the location and operation of the devices.

W. A. MUELLER

**Apparatus for filtration in an atmosphere free from carbon dioxide and moisture.** A. OGATA. *J. Pharm. Soc. Japan* No. 492, 81-2(1923).—The figure is self-explanatory. A, a dumbbell-shaped flask, which has been used for pptn., can be used directly in the app. By pushing up F, closing a, c, d, and opening f, the air in the app. can be replaced by the desired atm. D is filled with the wash soln., which can be used in any amt.



When the ppt. clogs the filter at B in such a way as to prevent the drawing up of the liquid from A, cock a can be used in such a manner as to maintain the soln. on B at a desired height. In filtration of basic lead nitrate with this app. a carbonate-free ppt. was obtained easily.

S. T.

A microbarograph. HANTARO NAGAOYA AND NAOSHI AYABE. *Sci. Papers Phys. Chem. Res.* 1, 135-8(1923).—The microbarograph records minute fluctuations of atm. pressure of short periods, by means of an extremely light and sensitive optical lever, which is connected with aneroid vacuum cells of very short period. The fluctuations of pressure can be continuously recorded on a photographic paper, or can be observed by a telescope. Fluctuations amounting to 0.001 mm. of Hg can be detected.

K. KASHIMA

Hydrogenated oil for oil baths. G. R. ROBERTSON. *Ind. Eng. Chem.* 15, 701 (1923).—Hard hydrogenated sesame or cottonseed oil is much superior to vaseline, paraffin or vegetable oil for oil baths. It eliminates fire hazard and on resolidification does not stick either to Fe or to glass.

C. C. DAVIS

Two pieces of demonstration apparatus for showing cloud-forming in moist air and the paths of  $\alpha$ -rays. C. LAKEMAN AND R. SINGH. *Physica* 3, 141-3(1923).—In the first instrument the cloud formed in a glass sphere attached to one end of a water manometer is made visible at distances up to 12 m. by means of a converging beam of light. The second instrument is a modification of Wilson's app. with a rather large cloud chamber. Both instruments are fully described with the aid of photographs. Also in *Physik Z.* 24, 235-6(1923).

C. C. VAN VOORHIS

Oxygen regulator design and seat materials. J. K. MABBS. Compressed Gas Manufacturers Assoc., *Bull. Tech. Series* 1923, 234-43 T. S.—The origin of most explosions is at the seat of the regulator. The following materials are reported as suitable for regulator seats: hard rubber, casein compds., fiber, ivory, phenol compds., metals and celluloid. These materials were subjected to the combustion test, heat of compression, temp., moisture absorption and hardness. Hard rubber was found most desirable. A discussion followed.

HOWARD E. BATSFORD

The evaporation of liquids under agitation. T. KAIUN. *J. Pharm. Soc. Japan* No. 192, 182-4(1923).—A convenient device is described. The evap. dish is provided with a stirrer connected with a celluloid toy fan and placed near an elec. fan. The air current created by the fan not only accelerates evapn. but keeps the celluloid fan going.

S. T.

A simple improvement in apparatus for the determination of oxygen in gaseous mixture. P. HETZLER. *Ber. Ges. Kohlentechn.* 2, 83-5; *Chem. Zentr.* 1922, IV, 7.—The use of P in pipets made of non-actinic glass is recommended. The rods must always be clean and bright yellow. The  $H_2O$  must be renewed often and maintained at 16-22°.

C. C. DAVIS

An installation for registering carbon dioxide and temperature of a generator furnace. J. W. M. BOURGOIGNON. *Hel. Gas* 43, 152-8, 187-93(1923).—The  $CO_2$  meter makes use of the lower heat cond. of  $CO_2$  as compared with air; by the method of Shakespeare, the temp. of a Pt wire heated electrically in an atm. of varying  $CO_2$  content is measured by means of its elec. cond. According to the variations of the heat cond., following changes of the  $CO_2$  content, the temp. of the wire varies and, according to this, its elec. cond., as measured in a Wheatstone bridge. A very durable app. has been constructed on this principle for technical use by the Cambridge and Paul Instrument Co., England. The  $CO_2$  content can be read off continually in gases in a pipe line or in a chimney, or can be registered automatically, with an accuracy of about 0.1%. The same firm has constructed a thermoelec. app. for reading off or registering the temp. of gases; the essential part of this app. is a thermocouple of Pt | Pt-Rh.

R. BEUTNER

Upper range of the quartz-fiber manometer. A. S. COOLIDGE. *J. Am. Chem. Soc.* 45, 1637-43(1923).—A bifilar quartz-fiber manometer free from troublesome harmonic vibrations is described. The instrument may be used to read pressures up to from 0.1 to 1 mm., depending on the gas, by a method involving the calibration over the whole range with a permanent gas and a McLeod gage, and in addition, either a single measurement with the gas used and a McLeod gage at relatively high pressure, or a knowledge of the viscosity of the gas. The gage may aid in the detn. of mol. wts. of gases at very low pressures.

C. C. VAN VOORHIS

A direct reading buret. A. M. JACKSON. *J. Optical Soc. Am.* 7, 491-4(1923).—A specially graduated tube a few cm. long slides over an ungraduated buret tube. The latter has the regular blue reading line and in addition a correction line. The graduations on the slide and the curvature of the correction line are so related to the variation in diam. of the main tube that correct readings may be taken over the length of the slide in any position on the tube. The buret is for work in which a series of tests requires only  $\frac{1}{2}$  cc. soln. for each test.

D. E. S.

**A new test-tube.** JULIUS ORIENT. *Biochem. Z.* 135, 182(1923).—A modified test-tube suitable for work with small amts. of material is described. G. E. S.

**Floating siphon.** EMIL KNAPS. *Chem.-Ztg.* 47, 486(1923).—A floating siphon for use in sepg. liquids from sediment is described. L. W. RIGGS

**Liquid distributors.** H. RABR. *Chem.-Ztg.* 46, 169-70, 220-2, 246-7, 266-9 (1922).—An illustrated description of the principles and equipment of various patented processes. C. C. DAVIS

**Stirrer efficiency.** ANON. *Chem. Met. Eng.* 28, 1077(1923).—An instance showing the good agitation effected by paddle stirrers. W. H. BOYNTON

**Gas electrode.** M. KNOBEL. *J. Am. Chem. Soc.* 45, 1723-4(1923).—The gas passes through a piece of graphite rod, hollowed out nearly to the bottom, and connected to a brass tube with a piece of rubber tubing. A spiral wire inside makes the elec. connection and the outside is platinized. Economy of gas and quick attainment of equil. results. C. C. VAN VOORHIS

**Apparatus for separating gas from water.** E. D. McWHORTER AND A. A. BENNETT. U. S. 1,459,594, June 19.

**Apparatus for drying finely divided material.** F. T. DOW. U. S. 1,459,326, June 19. Material to be dried or treated with gases for other purposes is passed downward through a succession of conical chambers against a counter current of heated air or other gas, which holds the material for the most part in suspension in each of the chambers.

**Viscosimeter.** C. R. RORR. U. S. 1,459,262, June 19. Adjacent parallel vertical tubes of identical size are filled, one with a material of standard viscosity and the other with a sample to be tested. Identical weights, *e. g.*, balls, are allowed simultaneously to descend through equal depths of the 2 materials in the tubes and the relative times of passage through the materials are taken as a measure of comparative viscosity.

**Apparatus for testing the fading action of light.** C. W. JAMESON. U. S. 1,458,941, June 19.

**Shaft furnace of the producer type.** A. HORTH. U. S. 1,459,627, June 19. The furnace is adapted for deoxidizing or for other purposes and comprises a central fuel shaft at the top terminating within a larger concentric chamber for material to be treated. The central column of material is discharged as ash at the zone of highest temp. and material from the outer concentric column is discharged at a higher level at the side of the furnace.

**Gas vent for corked vessels.** G. W. BENNETT. U. S. 1,459,704, June 19. A vent tube extending through the stopper of the receptacle to be vented is so bent as to itself form a support for a liquid-holding vessel into which the outlet end of the vent tube dips to form a seal.

## 2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK

**Advances in physical chemistry in 1922.** W. HERZ. *Chem.-Ztg.* 47, 297-8, 301-3, 346-8, 391-3, 405-8, 470-2, 493-5, 514-5(1923). E. H.

**Hans Goldschmidt.** JOSEF WEBER. *Chem.-Ztg.* 47, 533(1923).—Obituary. R. H.

**Chemical journals in Japan.** AKIRA SHIMOMURA. *Chemistry & Industry* 42, 617-8(1923).—Descriptive. E. J. C.

**The determination of the equilibrium constants of the water-gas equation in teaching.** P. RISCHBIETH. *Z. physik. chem. Unterricht* 35, 28-30(1922). E. J. C.

**A tardy correction.** CH. M. VAN DEVENTER. *Chem. Weekblad* 20, 331(1923).—R. Fresenius discovered *Na NH<sub>4</sub> racemate* (*Ann. chem. pharm.* 41, 9(1842)) not Scacchi, as recorded by van't Hoff and others. R. BEUTNER

**The Angstrom system of units.** T. M. LOWRY. *Rec. trav. chim.* 42, 29(1923).—The proposal of Tzentshshver (*C. A.* 17, 655) for a unit of mass was anticipated by Bragg (*C. A.* 16, 2504), who suggested that the Angstrom unit of length ( $10^{-10}$  cm.) should be made the basis of Angstrom units of area ( $10^{-20}$  sq. cm.), vol. ( $10^{-24}$  cc.) and mass ( $10^{-24}$  g.). E. J. WITZEMANN

**The heterocyclic theory of valence and water of crystallization.** H. T. F. RHODES. *Annales soc. espail. fis. quim.* 21, 149-61(1923).—A review and general discussion. L. E. GILSON

**Determination of equivalents.** A. O. JONES. *Chemistry & Industry* 42, 475 (1923).—A weighed sample of metal, *e. g.*, Mg, is placed in an Erlenmeyer flask provided

with a 2-holed stopper. Through one hole passes a 25-cc. pipet, the upper end of which is closed by a rubber tube and a pinchcock. Through the other a delivery tube leads evolved gases into a tube 45-50 cm. long and 2-3 cm. wide, closed at the upper end with a cork, and resting in a vessel of water. 25 cc. of acid are admitted to the flask, the vol. of H is measured by marking the point upon the tube to which water is depressed, and converting the length into vol.; the equiv. wt. is then calcd. as usual, after making the customary corrections for pressure, temp. and aq. tension. W. C. KRAUGH

Is there an element of zero atomic number? III. F. H. LORING. *Chem. News* 126, 371-2(1923).—Continuation of C. A. 17, 2524. G. L. CLARK

Revision of the atomic weight of mercury. O. HÖNIGSCHMID, L. BIRCKENBACH AND M. STEINHEIL. *Ber.* 56B, 1212-9(1923).—The mean of 12 detns. from the ratio  $\text{HgCl}_2:2\text{Ag}$ , as well as of 8 detns. from the corresponding bromide ratio, gave the value  $200.61 \pm 0.00$ , based on  $\text{Ag} = 107.88$ ,  $\text{Cl} = 35.457$  and  $\text{Br} = 79.916$ . A. E. STRARN

New methods of crystal analysis and their bearing on pure and applied science. WM. BRAGG. *Nature* 111, Suppl. iii-x(June 9, 1923).—A lecture treating in somewhat elementary fashion the use of X-rays in interpreting crystal structures, particularly of C and org. compds., with practical application to explanations of the strength and elasticity of materials, their power of conducting electricity and heat, and their elec. and optical properties. G. L. CLARK

A new method of crystal analysis and the reflection of characteristic X-rays. GEO. L. CLARK AND WM. DUANE. *J. Optical Soc. Am.* 7, 455-82(1923).—A detailed account of researches briefly reported in C. A. 16, 4134; 17, 2068, 2230. The following subjects are considered: (1) description of method, involving the abs. exptl. detn. of wave lengths from the crit. voltage ( $V$ ) in the quantum equation  $Ve = h\nu = hc/\lambda$ , where  $e$  is the charge of an electron,  $h$  Planck's action const.,  $c$  the velocity of light,  $\nu$  the frequency and  $\lambda$  the wave length; (2) precision crystal structure detns. of  $\text{KI}$ ,  $\text{CsI}$ ,  $\text{KI}_3$ ,  $\text{CsI}_3$  and  $\text{CsIBr}_2$ ; (3) detection and study of X-rays characteristic of  $\text{Cs}$ ,  $\text{I}$  and  $\text{Br}$ , excited in a crystal containing 1, 2 or 3 of these elements and reflected by the same crystal in accordance with the law  $n\lambda = 2d \sin \theta$ , thus enabling differentiation even between  $\text{Cs}$  and  $\text{I}$  atoms; (4) detection and study of X-rays characteristic of  $\text{I}$  abnormally reflected by  $\text{KI}$  crystals. G. L. CLARK

The crystal structure of molybdenite. R. G. DICKINSON AND LINUS PAULING. *J. Am. Chem. Soc.* 45, 1466-71(1923).—By the generally applicable methods based upon the results of the theory of space groups and taking the data from Laue and spectrum photographs, it is shown that the following is the simplest structure that can be assigned to the hexagonal mineral molybdenite,  $\text{MoS}_2$ : Mo atoms at  $1/3, 2/3, 1/2$ ;  $2/3, 1/3, 1/2$ ; S atoms at  $1/3, 2/3, 1/2$ ;  $2/3, 1/3, 1/2$ ;  $1/2, 1/2, 1/2$ ;  $1/2, 1/2, 1/2$ ; where  $u$  will have the value  $0.621 \pm 0.004$ . For the unit cell  $d_{\text{cell}} = 42.30 \text{ \AA}$ . and the axial ratio is 3.90. RALPH W. G. WYCKOFF

Precision measurements of crystals of the alkali halides. W. P. DAVRY. *Phys. Rev.* 21, 143-61(1923).—Measurements on powder photographs of each of the alkali halides are recorded, increased accuracy being obtained by filling half of the specimen tube with the crystal powder under investigation, the other half with  $\text{NaCl}$  as a reference substance. The dimensions of the unit cubes thus obtained are:

	Li.	Na.	K.	Rb.	Cs.
Fluorides	2.007	2.310	2.664	3.663	3.004
Chlorides	2.566	Assumed	3.138	3.287	4.118
Bromides	2.745	2.968	3.285	3.418	4.287
Iodides	3.537	3.231	3.525	3.655	4.553

The length of the side of the unit cube of  $\text{NaCl}$  is assumed to be  $2.814 \text{ \AA}$ . The arrangement of the ions in all of these salts is simple cubic except for  $\text{RbF}$ ,  $\text{CsCl}$ ,  $\text{CsBr}$  and  $\text{CsI}$ , for which it is body-centered cubic. RALPH W. G. WYCKOFF

The crystal structure of quartz. L. W. MCKEEHAN. *Phys. Rev.* 21, 503-8(1923).—X-ray powder photographs confirm the space-lattice proposed by others, but the arrangement of atoms which best fits the observed intensities differs somewhat from previous interpretations. The mols. of  $\text{SiO}_2$  are obtuse-angled isosceles triangles (angle at Si atom-center,  $115^\circ 14'$ ; distance between Si and O atom-centers,  $1.631 \times 10^{-8} \text{ cm}$ .) lying in the basal planes of each of 3 interpenetrating hexagonal space lattices, so that the crystal may be considered as built up of layers of mols., much closer together than adjacent mols. in the same layer. G. L. CLARK

Röntgenographic determination of the structure of urea and of tin tetraiodide. H. MARK AND K. WEISSBERG. *Z. Physik* 16, 1-22(1923).—Only 1 space lattice-

and 1 at. arrangement for urea agree with the X-ray data. Urea crystallizes in the tetragonal scalenohedric (V'd) system;  $a = 5.63$  and  $c = 4.70 \times 10^{-8}$  cm. The mol. remains intact in the lattice. The distance between N atoms in the mol. is approx. 2 Å., and the distance between the centers of 2 neighboring urea mols.  $> 3.98$  Å and  $< 4.82$  Å. SnI<sub>4</sub> has a cubic lattice with  $a = 6.04$  Å. The mols. exist intact with the I atoms arranged tetrahedrally around the Sn atom. (Cf. Dickinson, C. A. 17, 1740.)

G. L. CLARK

The form of the melting-point curve of binary mixed-crystal systems and the lattice parameters of their components. E. J. CUV. *Z. anorg. allgem. Chem.* 128, 241-4 (1923).—If, for the systems KCl-NaCl, KBr-NaBr, LiCl-NaCl, KCl-KI, KBr-KI, KCl-KBr, RbCl-KCl, Au-Cu, Cu-Ni, and Au-Ag,  $\Delta T_m (= \{T_m - [T_A + x(T_B - T_A)]\})$ , where  $T_A$  and  $T_B$  are the melting points of the components,  $T_m$  is the observed temp. of the beginning of crystn. of the mixed crystals and  $x$  the mol. fraction of the component B) is plotted against  $\Delta d (= (d_A - d_B)/[(d_A/2) + (d_B/2)]$ , where  $d$  refers to the lattice parameter of the components), a straight line results. It cuts the  $\Delta d$  axis for  $\Delta T_m = 0$  at 0.04; hence when the relative lattice parameter difference = 0.04, the temp. of the beginning of crystn. lies upon the straight line which joins the melting points of the pure components. When  $\Delta d < 0.04$ ,  $\Delta T_m$  is positive, and when  $\Delta d > 0.04$ ,  $\Delta T_m$  is negative. The straight line cuts the  $\Delta T_m$  axis at  $80^\circ$ . In other cases whether a max. or a positive deviation of the temp. of the beginning of crystn. from the straight line which connects the melting points of the 2 components, results, depends upon the relative difference in the lattice parameters and upon the difference in the melting points of the 2 components.

G. L. CLARK

Studies in certain problems of the kinetic theory. The hypothesis that the intramolecular force is some function of the distance. J. HAAO. *Compt. rend.* 176, 32-5 (1922).—By strictly mathematical devices H. avoids the difficulty of handling the differential equations for the elec. and thermal conductivity and the viscosity of dil. gases in the case where one gas of a mixt. is infinitely dil., and where the law of force is not known, and arrives at the general relation  $D/\sigma = RTm/\epsilon^2\rho$  where  $D$  is the coeff. of diffusion,  $\sigma$  the coeff. of elec. cond.,  $R$  the gas const.,  $T$  the abs. temp.,  $m$  the mol. wt.,  $\epsilon$  the Napierian base and  $\rho$  the density.

F. RUSSELL BICHOWSKY

The number of collisions of several molecules. J. K. SYRKIN. *Physik. Z.* 24, 236-9 (1923).—The following formula is derived by the theory of probabilities for the no. of collisions of  $n$  mols. in unit time:  $V = (N_1 n_1 N_2 n_2 \sigma^{n-1} / n_1! n_2! r) \sqrt{0.8} RT / \sqrt{[(m_1/M_1) + (m_2/M_2)]/(m_1 + m_2)}$ , where  $N_1$  = no. mols. of 1 gas in a unit of vol. and  $N_2$  that of another kind of gas;  $n_1$  and  $n_2$  are the resp. nos. in a very small collision vol.  $\sigma$ ;  $M_1$  and  $M_2$  are mol. wts. For 2 mols. this reduces to the usual Boltzmann expression,  $2.5 N_1 N_2 \sqrt{2} RT / \sqrt{(M_1 + M_2)/M_1 M_2}$  where  $S$  is the distance between the points of mass in the collision.

G. L. CLARK

The law of the relation between the viscosity of liquids and the temperature. HANS VOGEL. *Physik. Z.* 22, 645-6 (1921).—The formula  $\eta_t = \eta_{t_0} t^{-h}/(t - t_\infty)$  is proposed, where  $\eta_t$  is the viscosity at any temp.,  $\eta_{t_0}$  is the viscosity at another temp.,  $t_0$  and  $t_\infty$  are the temps. at which the viscosity is unity. It is said to give excellent agreement with all liquids, including water, mercury, and oils. Since only 3 detns. are required to obtain the consts. it is thought that the formula will be useful in oil technology.

EUGENE C. BINGHAM

The decrease in conductivity of molten aluminium chloride and the constitution of the aluminium halides. WILHELM BILTZ AND ARTHUR VOIGT. *Z. anorg. allgem. Chem.* 126, 39-53 (1923).—The pure Al halides were distd. in a glass sealed app. contg. a cond. cell, m. p. vessel and pycnometer. A paraffin bath was used for heating at the lower temps. and the temp. measured with an Fe-constantan thermoelement. Of the molten halides the AlI<sub>3</sub> had the greatest, AlCl<sub>3</sub> an intermediate and AlBr<sub>3</sub> the least cond. The values at  $230^\circ$  were: AlI<sub>3</sub>,  $4.1 \times 10^{-4}$ , AlCl<sub>3</sub>,  $0.9 \times 10^{-4}$ , and AlBr<sub>3</sub>,  $1.5 \times 10^{-7}$ . On the other hand the temp. coeff. changes in the normal order of the halides. D. measurements were made at various temps. and the coeffs. of expansion of the liquid halides were found to vary considerably. The computed values are: AlI<sub>3</sub> = 0.0008, AlBr<sub>3</sub> = 0.001, and AlCl<sub>3</sub> = 0.002. The cond. of cryst. AlCl<sub>3</sub> increases with rising temp. from zero to a max. of the order of  $10^{-4}$  reciprocal ohms, falls sharply within a degree at the m. p. and then slowly rises in the order of  $10^{-7}$  reciprocal ohms. B. and V. conclude that in the crystals of AlCl<sub>3</sub> an ion-lattice exists, while the melt consists almost wholly of mols.

L. T. FAIRHALL

Viscometric researches on lyophobic sols. H. G. BUNGENBERG DE JONG. *Rec. trav. chim.* 42, 1-24 (1923).—Although the viscosity of lyophobic colloids is but slightly different from that of the disperse medium, lyophobic colloids show a very pronounced increase in viscosity even for small concns. This property has been much studied but

the certainty of the interpretation of the observed alterations in viscosity is inversely proportional to the extraordinary extent of the exptl. material. Thus Wo. Ostwald (C. A. 7, 8874) summarizes the following 10 variables which can cause an alteration in the viscosity: concn. temp., degree of dispersity, solvate formation, elec. charge or ionization, the previous thermal treatment, the previous mechanical treatment, inoculation with small quantities of more viscous colloids, time and addn. of other substances. According to Hatschek (C. A. 8, 281) viscosity is also dependent on the rate of shear. Hess (C. A. 15, 7) and Rothlin (C. A. 14, 1473) also discuss a shearing elasticity that changes the rate of flow. The latter also concludes that a no. of lyophilic colloids do not follow Poiseuille's law, which would make viscometric detns. on these colloids of illusionary importance. de J., on the contrary, is convinced that with certain precautions viscosity detns. may give an insight into the condition of emulsoid sols. A brief summary of his results follows: Usually an accuracy of more than a few % is all that can be claimed for the method usually used in the viscosity detns. found in colloid chem. literature. The conditions necessary to obtain an accuracy of 0.1-0.2% are discussed. Stress is laid especially on 2 important sources of error: the systematic error in relation to the size and character of the capillary of the viscometer (Grüneisen, *Wissensch. Abh. d. Phys. Techn. Reichsanstalt* 4, 151(1905)); and the defective method of setting the viscometer. Many viscosity measurements cannot be used as a basis for theoretical consideration because the systems investigated did not follow Poiseuille's law (Hess and Rothlin *l. c.*) or because the flow was influenced by mechanical treatment. These deviations are ascribed not so much to the presence of a resistance to elastic deformation along with the frictional resistance of the liquid system, but to a greater extent to an alteration in the structure of the system itself and consequently in the frictional resistance also. According to the conditions of flow, the gelatinizing aggregates (Bachmann, C. A. 7, 1435) formed in the deviating systems of Hatschek, Hess and Rothlin, would be broken down to different extents. Viscosity measurements on similar liquid gels are of little value in the study of the emulsoid sol state even when they are made under large differences in pressure. The aggregates are never completely broken down to the smallest elements as is clearly shown by Rothlin's expts. The viscometric method is of no use for studying gelatin and coagulation processes. Rothlin's division of lyophilic sols into 2 groups, the first of which follows Poiseuille's law exactly, and the 2nd only for large pressures, cannot be maintained, since agar sol, which according to Rothlin at 27° shows deviations of more than 100%, follows P.'s law exactly (within 0.1-0.2%) at 50°, *i. e.*, above the gelation temp. (40°). Under these conditions agar sol behaves very simply in comparison with gelatin and other sols; hysteresis phenomena are completely absent as well as complications due to changes in concn. and temp. The latter are completely reversible above the temp. of gelation. The influence of previous mechanical treatment is completely absent. On diln. with electrolytes a final equil. is reached at once. The only alteration with the time that occurs in an agar sol is a slow decrease, which must be attributed to a destruction (hydrolysis) of the disperse phase, and for which a correction must be applied. It is desirable to find the conditions for each of the sols that show deviation from P.'s law under which this is no longer the case and in which they behave in all other respects like simple systems. A clearer insight into the condition of emulsion sols can then be obtained by accurate viscometry.

E. J. WITZEMANN

**Diffusion of dyes in gels.** I. TRAUBE AND M. SHIKATA. *Kolloid-Z.* 32, 313-6 (1923).—Narrow test-tubes were partly filled with solns. of varying concn. of gelatin, agar, or soap and allowed to gel. After 24 hrs. 2 cc. of 0.1% soln. of dyes were placed on top and the distance the dye diffused into the gel in 48 hrs. was measured. For gelatin it is found that  $C/D$  is const. for each dye,  $C$  being the concn. of gelatin and  $D$  the distance the dye diffused. Conclusion: The av. path of a dye particle in a gelatin gel is proportional to the av. distance between gelatin particles. The rule does not hold for agar or soap gels, indicating that these gels have a different structure from gelatin. The distance of penetration of the dyes in a gelatin gel of given concn. is taken as a measure of the size of particles of the dye. 13 acid and 3 basic dyes were studied.

F. L. BROWNE

**The velocity of diffusion into jellies accompanied by chemical reaction.** MANJIRO WATANABE. *Kolloid-Z.* 32, 320-8(1923).—Gelatin solns. contg. one reaction component were allowed to set in narrow glass tubes and a layer of a soln. of the second component, forming an insol. compd. with the first, was placed on top. The rate of progress of the band of ppt. in the gel was noted. For  $\text{NH}_4\text{OH}$  diffusing into gels contg.  $\text{CuSO}_4$  or  $\text{ZnSO}_4$  the value of  $x/\sqrt{t}$ , where  $x$  is the distance the ppt. penetrates in time  $t$ , is not const. as would be the case if Fick's law of diffusion held, but decreases with time.

For  $\text{FeSO}_4$  diffusing into gel contg.  $\text{Na}_2\text{S}$ , the value of  $x/\sqrt{t}$  increases with time. In all cases the behavior can be expressed by the equation  $x/\sqrt{t} = [(Z - x)/Z] \times k$ , where  $k$  is the initial velocity of diffusion and  $Z$  is the time required for max. penetration of the ppt. into the gel. The departure from Fick's law is due to diffusion of the salt contained in the gel into the upper soln. where it removes some of the salt in this soln., thereby decreasing its rate of diffusion into the gel. and to the removal of the salt diffusing into the gel by reaction with the salt contained therein, thereby tending to increase the rate of diffusion into the gel.

F. L. BROWNE

**The coagulation of sols with reversed charges.** H. FREUNDLICH AND H. BUCHLER. *Kolloid-Z.* 32, 305-11(1923).—The negatively charged hydrosols of Au, Ag, and  $\text{As}_2\text{S}_3$  were changed to positively charged sols. by addn. of salts of strongly adsorbed, multivalent cations such as  $\text{Th}(\text{NO}_3)_4$ , basic dyes, and alkaloid salts. The adsorption potential was then detd. by cataphoresis measurements as well as the coagulating values of various electrolytes. They all behaved toward electrolytes like normally positive sols, being sensitive to the anions. The more strongly adsorbed the ion causing reversal of the charge, the lower is the concn. required for it to coagulate or to reverse the charge, the greater the stability of the sol with reversed charge, and the higher the coagulating value of other electrolytes. For reversal of the charge of a sol it is not only necessary that the ion responsible be of high valence and powerfully adsorbed, but the concn. of the sol must be low enough to reduce the velocity of coagulation at the isoelec. point sufficiently to enable the recharging to take place before coagulation sets in.

F. L. BROWNE

**Ferric oxide jellies.** FRL. E. SCHALEK AND A. SZEGVARY. *Kolloid-Z.* 32, 318-9 (1923).—The addn. of slightly less than enough electrolyte,  $\text{KCl}$  or  $\text{Na}_2\text{SO}_4$ , to cause coagulation to a 6 to 10%  $\text{Fe}_2\text{O}_3$  hydrosol causes it to set to a jelly. The jelly is not very elastic and has the consistency of dough. On shaking it becomes fluid again and cannot be distinguished from the original sol, but on standing again sets to the jelly. This process may be repeated as often as desired without apparent change. The time required to set to a jelly again from the fluid condition decreases rapidly as the concn. of the added electrolyte increases or with increasing temp.

F. L. BROWNE

**The elasticity of organogels of cellulose acetate.** E. W. J. MARDLES. *Trans. Faraday Soc.* (advance proof)(1923).—Young's modulus was measured by observing the extension of rods or strips on loading by means of a travelling microscope. The relative modulus of rigidity was observed by letting the sol set to a gel between two coaxial cylinders, the outer one of which was then held firmly while the inner one was rotated under the load. The specimens were maintained at const. temp. and humidity. The characteristic behavior of plastic solids was observed, the application of the load resulting in (a) an instantaneous elastic deformation, (b) a further reversible deformation which is a function of time (secondary strain), (c) viscous or plastic flow which is irreversible. For gels of cellulose acetate in benzyl alc. the modulus of rigidity was detd. for concns. from 1 to 30% and temps. from 0° to 20°. There is a very marked hysteresis effect for gels made with rising and falling temps. The curves of  $\log E$  (logarithm of modulus of rigidity) against concn. show a flexure at about 8% concn. which disappears at higher temp. and which seems to correspond with the point of max. Tyndall number. The curves for  $\log E$  vs. temp. are rectilinear and have the same slope at all concns. There is no abrupt transition from sol to gel during setting and the spontaneous changes continue after the stage of zero fluidity is reached, the rigidity increasing for some time, at first rapidly, then slowly. When a gel at one temp. is cooled there is a similar increase of rigidity with time. These phenomena are "ascribed to the formation with time, while under stress, of a metastable phase, due to the altered orientation of the mol. composing the complexes which have aggregated to form the gel structure."

F. L. BROWNE

**A method for the ultramicroscopic measurement of velocity of cataphoresis.** H. R. KRUYT AND A. E. VAN ARKEL. *Kolloid-Z.* 32, 91-5(1923).—By means of a specially designed ultramicroscope cell, with Cu-CuO and Ag-AgCl electrodes, the cataphoresis of Se sols was detd. at various distances from the cell walls. A method is given for calcg. the interface potential between the sol and disperse medium from such data. The value found for Se sol is 43 millivolts.

BENJAMIN S. NEUBAUSEN

**Influencing adsorption processes by the presence of colloids in the sol condition.** HERMANN WYLL. *Kolloid-Z.* 32, 311-3(1923).—The adsorption of dyes from aq. soln. by filter paper is found to be diminished if the soln. also contains gelatin. This is attributed to adsorption of the dye by the gelatin. This has a biological significance in that the adsorption of arsenamine, *a. g.*, from the blood stream by the cell walls is hindered by the presence of colloids in the blood.

F. L. BROWNE



The relations between adsorption and dispersity of dyes. I. TRAUBER AND M. SHIKATA. *Kolloid-Z.* 32, 316-8(1923).—The adsorption of 24 acid dyes by a mineral consisting chiefly of  $MgCO_3$  and  $CaCO_3$  as well as by the pure carbonates was measured and compared with the dispersity as detd. by the distance of diffusion of the dye solns. into gelatin gels of const. concn. Roughly the adsorption is greater the higher the dispersity of the dye. The rule does not hold for basic dyes. F. L. BROWNE

Adsorption from the gas phase at a liquid-gas interface. I. THOMAS IREDALE. *Phil. Mag.* 45, 1088-1100(1923).—The drop-weight method of measuring surface tension was adopted, where the drop is allowed to form so slowly in an atm. of the gas or vapor in question that statical conditions are practically attained. The modern drop-wt. literature is reviewed and critically compared with the old somewhat neglected work. Certain changes in the theoretical and exptl. treatment are made. The Gihb's formula for adsorption from the gas phase is used. Preliminary expts. with org. vapors in  $H_2O$  showed that the surface tension lowering is greater the greater the soly. in  $H_2O$ , so that one is restricted to compds. of slight soly., such as the satd. hydrocarbons. More complete expts. were made on the effect of org. vapors on Hg. The vapors used were dissolved in air which was found to have little influence under static conditions. Actual data obtained with various pressures of MeOAc are shown. Calcn. indicates an adsorbed mono-mol. layer. The change from adsorption to condensation is abrupt and will be further investigated. S. C. L.

Sorption equilibria. H. V. EULER AND BIRGER BUCHT. *Z. anorg. allgem. Chem.* 126, 269-77(1923).—The soly. of casein in alc.-water solns. of chloroacetic acid and in alc. and benzene solns. of  $\alpha$ -bromopropionic acid is measured and the sorption of the acid by the casein is detd. The amt. of acid adsorbed by the casein is a linear function of the acid concn. in the soln. No optical activity could be detected in the residual benzene soln. of  $\alpha$ -bromopropionic acid, after much of the acid had been adsorbed by casein, and it is concluded that asymmetric sorption does not exceed 10% of the whole. J. A. ALMQUIST

Solubility and chemical constitution. H. J. PRINS. *Rec. trav. chim.* 42, 25-8 (1923).—"The researches of Harkins (*C. A.* 15, 966) and Langmuir (*C. A.* 10, 3007) lead to the conclusion that soly. and adsorption are closely related; both authors attribute the orientation phenomena with water to the tendency of the polar group to dissolve in  $H_2O$ . In reality this conclusion is erroneous; the arbitrary circumstance that these researches are carried out with  $H_2O$  as one component and mostly org. substances containing a group more or less similar to  $H_2O$  as the other component, can easily lead to misunderstanding." The adsorption phenomena elucidated by both authors are caused by chem. forces of a more or less sp. nature. With org. acids and water soly. and adsorption are both caused by the same group, but this is not necessarily the case. For org. substances the soly. in a hydrocarbon mixt. like petroleum ether does not directly depend upon the polar or active groups but upon the satd. hydrocarbon groups. The soly. in petroleum ether of a series of org. compds. (taulated) is increased by the same groups ( $CH_3$ ,  $CH_3$ ) that decrease the soly. in  $H_2O$  or dil. alc. In another table data are given which show that soly. depends upon the similarity in kind and no. of atoms present in the substances in question. Chem. compds. can be classed as homo and hetero compds. depending upon whether they are built up of the same or different kinds of atoms. In the same way complex compds. can be divided into 2 classes: complex homo and complex hetero compds. A liquid A.B is considered as a changing mixt. of complex homo compds.  $(A.B)_n$ ,  $(A.B)_m$ , etc. Complete miscibility occurs with A'.B' if it can replace A.B in the complex compds. without causing a considerable change in the at. and link energy (Prins, *Chem. Weekblad* 13, 525(1916); 15, 101(1918); 16, 693(1919)). The complex homo compds.  $(A.B)_n$  are built up from A.B's by the latter losing the greater part of their at. energy. A'.B' can only replace A.B if the at. energy of both is of the same quality and quantity. If a complex homo compd.  $(A.B)_n$  is dissociated into A.B by a supply of energy, the atoms A and B of the resulting compd. have a certain amt. of at. energy. This amt. is the same if A.B originates from  $(A.B)_n$ ,  $(A.B)_m$  when A'.B' is similar to A.B, but if there is considerable difference as with C.D the latter cannot replace A.B without changing so that the at. and link energy is totally different. When energy is supplied to dissociate such a complex the resulting components are not the original ones, but either A.B or C.D or both have larger amts. of at. energy; they are much more active than they were before they entered the complex. This is an important factor in catalysis and at the same time in adsorption, inasmuch as the latter represents a case of hetero complex formation. E. J. WITTELMANN

The rate of solution of copper in dilute benzaldehyde and its dependence on the viscosity. FRITZ SCHAAF. *Z. anorg. allgem. Chem.* 126, 237-53(1923).—Metallic Cu

dissolves in BzH, diluted with certain organic liquids, to form a green compd. (Bernoulli and Schaaf, *C. A.* 17, 2569) which is referred to as BzH Cu and corresponds to the formula  $C_6H_5O_2Cu$ . The rate of soln. is detd. by noting the decrease in wt. of the Cu with time. The rate is independent of the mass of Cu present but is proportional to the square root of its surface. The rate of soln. also varies with the substance used as a diluent for the BzH as shown in a table which gives the rates for a number of solvents containing 10% BzH by vol. This variation has no relation to the chem. constitution of the solvent, but is proportional to the fluidity of the soln. As the concn. of BzH in a given solvent is increased the rate at first increases, reaches a max. and gradually decreases to zero for the pure BzH. This max. occurs at 16 vol. % with toluene as the solvent at 50°. The initial increase of the rate is attributed to the increase in the active mass of the BzH; at the max. the retarding effect of decreasing the fluidity by increasing the BzH concn. begins to predominate over the active mass effect and the rate decreases to zero. The rate of soln. increases with temp. increase. J. A. ALMQVIST

Refractive indices of solutions of hydrochloric acid, acetic acid and ethanol in water at 25° and 30°. H. M. ELSEY AND G. L. LYNN. *J. Phys. Chem.* 27, 342-5 (1923).—Values of  $n_D$  are given in tables for concns. in g. per 1000 g.  $H_2O$  of HCl, 0-160.3; HOAc, 25.37-405.32; EtOH, 24.93-397.12. Numerous references to previous data are given. C. C. DAVIS

The theory of electrolytes. I. Lowering of freezing point and related phenomena. P. DEBYE AND E. HÜCKEL. *Physik. Z.* 24, 185-206 (1923).—A mathematical paper in which the theory of electrolytic solns. is approached from the point of view of thermodynamics. The elec. potential energy of ionic solns. is investigated, and certain effects in accord with data are predicted, as follows: (a) in dil. solns. of electrolytes the deviation of any measured colligative property from the value given by classical theory is proportional to the concn.; (b) if a dissolved mol. dissociates into  $n_1, \dots, n_i, \dots$  kinds of ions with valences  $v_1, \dots, v_i, \dots$ , the deviation of colligative properties from classical theory is proportional to  $w$ , where  $w = (\sum n_i v_i^2 / \sum n_i)^{1/2}$ ; (c) this deviation is also proportional to the  $1/2$  power of the dielec. const. of the solvent. The final dissociation equation for dil. solns. is  $\sum \delta N_i \log c_i = \log (f_\pm K)$  where  $K$  is the ordinary dissociation const.,

$f_\pm$  the activity coeff.,  $c_i$  the mol. fraction of the ion  $i$ , and  $\delta N_i$  the variation of  $N_i$  when equilibrium is in any way displaced. The summation is between the first ion split off and the final ion resulting from complete dissociation of the mol. The activity coeff. of the " $i$ " ion is given by  $\log f_i^s = (e^2 \kappa / 2 D k T) z_i^2$  where  $e$  is the elec. quantum,  $D$  the dielec. const. of the solvent,  $T$  the temp.,  $z$  the valence,  $k$  the Boltzmann const., and  $\kappa^2 = (4\pi e^2 / D k T) \sum n_i z_i^2$ . A. E. STEARN

Velocity of reactions in mixed solvents. V. (a) The velocity of formation of quaternary ammonium salts. (b) The study of an intramolecular change. JOHN DEXTER, HAMILTON MCCOMBIE AND H. A. SCARBOROUGH. *J. Chem. Soc.* 123, 1229-41 (1923); cf. *C. A.* 17, 1573.—The curve for the velocity of addn. of  $BrCH_2CO_2Et$  to  $C_6H_5N$  in EtOH- $H_2O$  mixts. shows that as the % of  $H_2O$  in the solvent medium is increased, the value of  $k$  rises smoothly and slowly until about 40% of  $H_2O$  is present, after which the value of  $k$  rises sharply with the increase of the  $H_2O$  content of the solvent. The relation between  $k$  and the compn. of the solvent medium could not be expressed as a hyperbolic or logarithmic function. The continuous curve obtained is explained by the assumption that there is no union between one of the reactants and the solvent complex. In the examn. of the curve obtained in the reaction between  $p-O_2NC_6H_4COCl$  and  $Me_3N$  in  $C_6H_5$ - $PhNO_2$ , it is found that it is divisible into 3 linear sections; the points of intersection of the sections occur at 29 and 59.4% of  $PhNO_2$  and correspond to the complexes  $4C_6H_5$ - $PhNO_2$  and  $C_6H_5$ - $PhNO_2$ . The curve for the tautomeric change of Me 5-hydroxy-1-phenyl-1,2,3-triazole-4-carboxylate in EtOH- $H_2O$  again shows similarities to those obtained in the sapon. of an ester. There is a marked change in direction at 81.7, 56.4 and 31.4% of EtOH, compns. which seem to indicate the complexes  $5EtOH$ · $3H_2O$ ,  $EtOH$ · $2H_2O$  and  $EtOH$ · $6H_2O$ . The complexes represented by the compns. 81.2% and 31.4% EtOH seem to be well established; the complex  $EtOH$ · $2H_2O$  has not been observed before but it has been deduced from other phys. measurements. C. J. WEST

Detonating-gas catalysis with the platinum metals. V. K. A. HOFMANN. *Ber.* 56B, 1165-72 (1923).—Ir is the ideal detonating-gas catalyst. Even after pre-treatment with either  $H_2$  or  $O_2$  it will still activate the reaction of  $H_2$  and  $O_2$  equally rapidly and in the proper proportions. It does not seem selectively to adsorb either gas, as shown by its potential. It has the advantage of being equally effective whether in an acid or alk.

environment. Pt and Pd contact masses show variations with reaction and with pre-treatments with either of the gases.

**The behavior of materials at low temperatures in relation to the new theories of Planck and Einstein.** A. E. STRARN. *Wärme* 45, 483-6; *Chem. Zentr.* 1923, I, 13.—The remarkable phenomena which appear at low temps., such as decrease in heat capacity of solids, disappearance of elec. resistance and the degeneration of gases, can all be explained by the quantum theory.

**The specific heats of carbon, silicon, and silicon carbide.** A. MAGNUS. *Ann. Physik* 70, 303-31 (1923).—By app. and methods differing little from those already described (*C. A.* 7, 2146; 10, 1954) the total heats were observed from room temp. to 12 or more temps. for each substance up to 900°. The calorimeter temp. was read to 0.00005°, but its true value was dependent on the rate of an unregulated water bath, which was controlled by a thermometer divided to hundredths, and was assumed to be const. for an hour. The room temp. was const. to a few tenths of a degree. Detns. with 2 furnaces at 282° differed by over 1%, which appears to set a lower limit for the error near this temp.; duplicate results generally agreed to a few per mille. The results agreed, nearly always to better than 1%, with the following formulas for total heat to 0°, which were derived by least squares: graphite,  $Q_0 = 0.1520t + 3.8885 \cdot 10^{-4}t^2 - 2.885 \cdot 10^{-7}t^3 + 1.4718 \cdot 10^{-10}t^4 - 4.385 \cdot 10^{-14}t^5$ ; Si,  $Q_0 = 0.1723t + 6.40 \cdot 10^{-4}t^2 - 2.575 \cdot 10^{-7}t^3$ ; carborundum,  $Q_0 = 0.15524t + 1.9807 \cdot 10^{-4}t^2 - 1.0666 \cdot 10^{-7}t^3 - 4.264 \cdot 10^{-11}t^4 + 5.551 \cdot 10^{-14}t^5$ . Weber's early results prove to differ from 2 to 5% for Si and graphite. The cubical expansion coeff. of carborundum was detd. over the interval 0° - 25.027°, and found to be  $8.8 \times 10^{-4}$ . Values of  $C_p$  were detd. by the method of former papers (*C. A.* 7, 2146, 16, 2631). To these was applied Debye's formula for sp. heat, resulting in expressions containing characteristic temp. each for Si, carborundum, and diamond (Weber's and Nernst's results), and 2 for graphite. This is held to accord with the symmetries of the various probable at. arrangements, since these govern the no. of different vibration periods. The numerical agreement between the Debye functions and observation is as good as the probable exptl. accuracy, except below 100° K., where correspondence fails utterly.

**Relations concerning the internal heat of vaporization.** J. E. MILLS and P. K. SMITH. *J. Phys. Chem.* 27, 301-21 (1923).—An equation given by M. had, in 1910, been transformed by Steinhaus into  $\mu'\sqrt{v} + CRT \ln v = \mu'\sqrt{V} + CRT \ln V$  where  $\mu'$  and  $C$  are consts., peculiar to the substance, containing the latent heat as a factor,  $d$  and  $D$  are densities, and  $v$  and  $V$ , vols., of 1 g. of liquid and satd. vapor, resp. This equation has been tested for 12 substances (from zero to the crit. temp.) and the results, which are tabulated, show that the equation is remarkably exact whenever  $\mu'\sqrt{v}$  is greater than  $3/2 RT$ . In 6 of the 12 the variation of the const. is less than 1%.

**The mass effect in the entropy of substances.** E. D. EASTMAN. *J. Am. Chem. Soc.* 40, 80-3 (1923).—E. prefers to use an equation for the entropy of diat. gases which involves the product of the at. wts., rather than their sum, because this form is consistent with the equation for monat. gases (cf. Latimer, *C. A.* 15, 1842). Deviations from the equation are supposed to be due to terms involving the amplitude of at. vibration. The amt. of this deviation may be calcd. for metals by using the equation of either Lindermann or Einstein. Results of either calcul. agree about equally well with expt.

**The potentials of lead-tin alloys.** S. D. MUZAFFAR. *Z. anorg. allgem. Chem.* 126, 254-6 (1923); cf. *C. A.* 17, 1916.—M. has measured the potential of a series of Pb-Sn alloys, contg. 0-100% Sn, against a calomel electrode. With KOH soln. and with Pb acetate dissolved in AcOH as electrolytes, in both of which Sn is more electropositive than Pb, an abrupt increase in the e. m. f. occurs between 9-10% Sn. It seems likely that there is present in these alloys a complex which contains about 9% tin.

**The measurement of overvoltage.** S. GLASSTONE. *Nature* 111, 775 (1923).—In order to eliminate the errors inherent in the usual methods of measuring overvoltage, it is proposed to use a commutator with a "choking coil" of high self-inductance in order to reduce induced current to a negligible amt. Further, instead of polarizing and potentiometer circuits being made for equal intervals of time, the latter will only be complete for 10° in each revolution, so that for 97% of the time the polarizing current will flow through the cell. In this way it should be possible to det. the potential of the electrode at the instant of breaking the current and the results compared with those obtained while current is still flowing in order to det. the effect of the so-called "transfer resistance."

G. L. CLARK

The possibility of an experimental proof of spacial quantization in an electric field. OTTO STERN. *Physik Z.* 23, 476-81(1922).—The resolving effect on an elec. field on a linear stream of atoms is calcd. from the simple Bohr theory for H. This is about 0.001 that found by Stern and Gerlach for magnetic resolution. For alkali metals the magnitude is calcd. from consideration of the *inhomogeneous Stark effect*, of which a very simple mathematical discussion is given. The effect expected should be measurable under proper exptl. control (not yet obtained).

Structural colors in feathers. I. C. W. MASON, W. D. BANCROFT, E. M. CHAMOT, AND ERNEST MERRITT. *J. Phys. Chem.* 27, 210-51(1923).—An extended investigation of the cause of the color in blue and green feathers. Non-iridescent blue feathers contain no blue pigments and no other structural cause of blue color. The color is due to the scattering of blue light by very fine pores in the walls of the outer layers of cells of the barbs of the feather. This is the so-called Tyndall blue commonly observed in turbid media. Green feathers are essentially the same as the blue except that the blue cells are overlaid by a transparent yellow layer.

A new phototropic compound of mercury. Y. VENEATARAMAIAH AND BH. S. V. RAGHAVA RAO. *Nature* 111, 775(1923).—The compd.  $\text{Hg}(\text{HS})\text{CNS}$ , prepd. by the interaction of a mercuric salt with  $\text{NH}_4\text{SCN}$  and thio-urea in a soln. of  $\text{AcOH}$  in the presence of an oxidizing agent ( $\text{KNO}_3$ ), or by the action of  $\text{H}_2\text{S}$  on  $\text{Hg}(\text{CNS})_2$ , is the most phototropic compd. as yet known. It is affected by strong sunlight in less than  $1/60$  sec. and by diffused daylight in a few secs. A compd. prepd. by the action of I on the above is also phototropic.

Studies on oxidation-reduction. I. Introduction. W. M. CLARK. *U. S. Public Health Reports* 38, 443-5(1923).—Preliminary to the investigation of various dyes and their reduction products or reductants as indicators of oxidation-reduction intensity the concept of the potential of inorg. oxidation-reduction reactions is applied to org. reactions. II. An analysis of the theoretical relations between reduction potentials and  $p_H$ . W. M. CLARK AND BARNETT COHEN. *Ibid* 656-83.—On the basis of the electronic conception of oxidation-reduction reactions, the reductant is identified with an anion of an acid so that its concn. will depend not only upon the total reductant present but also on the  $p_H$  of the soln. The equation which had been derived in the first paper is therefore brought into the general form  $E_h = E_o - (RT/nF)\ln([S_o]/[S_r]) - (RT/nF)\ln$  [function of  $[H^+]$  and equil. consts.]. In this equation  $E_h$  signifies the e. m. f. of the half cell contg. an indifferent electrode and the oxidation-reduction mixt. against the normal H electrode;  $E_o$  is a const. characteristic of each reaction;  $R$ ,  $T$  and  $F$  have the usual significance;  $n$  is the no. of electrons transferred from reductant to oxidant; and  $[S_o]$  and  $[S_r]$  are the total concns. of oxidant and reductant. The courses of various possible reactions differing in values of consts. of the acid and in the  $p_H$  of the reactions are then calcd. and the curves plotted. Oxidation-reduction reactions can be expressed in terms of O or H pressures. This work will be applied to actual reactions. III. Electrode potentials of mixtures of 1-naphthol-2-sulfonic acid indophenol and the reduction product. *Ibid* 933-58.—1-Naphthol-2-sulfonic acid indophenol,  $4\text{-O-C}_6\text{H}_4\text{-N-C}_6\text{H}_4(\text{SO}_3\text{H})\text{OH}$ -(3,4) or  $4\text{-HOC}_6\text{H}_4\text{-N-C}_6\text{H}_4(\text{SO}_3\text{H})\text{O}$ -(3,4) was prepd. as its Na salt, which is probably a deriv. of the second tautomer, from  $\text{O-C}_6\text{H}_4\text{-NCl}$  and  $1,2\text{-C}_6\text{H}_4(\text{OH})\text{SO}_3\text{Na}$ . The reduction potential of this compd. in equil. with its reduction product,  $\text{HOC}_6\text{H}_4\text{NHC}_6\text{H}_4(\text{SO}_3\text{Na})\text{OH}$ , at different  $p_H$  values was studied by reducing the oxidant with titanous ion, or with sulfide or hydrosulfide, by oxidizing the reductant with oxygenated  $\text{H}_2\text{O}$ , or by mixing different equimol. solns. of oxidant and reductant. The measurements at  $30^\circ$  conform fairly with the equation  $E_h = 0.554 - 0.03006 \log ([S_r]/[S_o]) + 0.03006 \log [K_1K_2[H^+] + K_1[H^+]^2 + [H^+]^3] - 0.03006 \log [K_o + [H^+]]$ , in which  $[S_r]$  is the concn. of total reductant;  $[S_o]$  that of total oxidant;  $K_1$  ( $= 8.01 \times 10^{-10}$ ) the dissolution const. of the phenolic group in the reductant which is possessed by the oxidant;  $K_o$  ( $= 2.09 \times 10^{-9}$ ) is the dissolution const. of the same group in oxidant and  $K_2$  ( $= 2 \times 10^{-11}$ ) is the dissolution const. of the phenolic group created by the reduction. The hypothetical normal potential is 0.5440. The reduction of this dye should indicate minute degrees of physiological reduction.

BENJAMIN S. NEUBAUSEN

BOLTZMANN, LUDWIG: Vorlesungen über Gastheorie. II. Theorie van der Waals'; Gase mit zusammengesetzten Molekülen; Gasdissociation; Schlussbemerkungen. 3rd. ed. Leipzig: J. A. Barth. 285 pp. Cf. C. A. 4, 1712.

## 3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Static or dynamic atom? N. R. CAMPBELL. *Nature* 111, 509(1923).—Discussion of the success of the new Bohr atom in bridging the gap between the chemist's static and the physicist's dynamic atom. G. L. CLARK

Atomics and the macrocosm. WALTHER GERLACH. *Z. angew. Chem.* 36, 214-7 (1923).—Review of the work of Saha and others on the application of the quantum theory of at. structure to the interpretation of stellar spectra. R. S. MULLIKEN

Paramagnetism and the structure of the atom. B. CABRERA. *J. phys. radium* 3, 443-60(1922).—A discussion. A. E. STEARN

Atomic weights of isotopes of mercury. O. HÖNIGSCHMID and L. BIRCKENBEACH. *Ber.* 56B, 1219-21(1923).—Samples of a light and heavy fraction of Hg obtained by Brönsted and Hevesy through ideal distn. were repurified and the at. wts. directly detd. The light fraction, sp. gr. 0.999824 (on basis of ordinary Hg as 1.00000) yielded from the ratio  $HgCl_2:2Ag$  the value 200.567 and from the corresponding bromide ratio, 200.562. A fraction of sp. gr. 1.000164 gave values of 200.637 and 200.628. The means, 200.564 and 200.632, correspond to a difference in sp. gr. of 0.00034, which is exactly the difference between the 2 gravities. A. E. STEARN

The fundamental atomic orbit. M. A. CATALÁN. *Anales soc. españ. fis. quim.* 21, 162-5(1923).—A brief general discussion. L. E. GILSON

The light elements and the whole-number rule. F. W. ASTON. *Nature* 111, 739(1923).—By means of a new method of generating anode rays of high velocity the masses of  $Li^6$ ,  $Li^7$ ,  $He^4$ ,  $Na^{23}$ ,  $Mg^{24}$ ,  $K^{39}$ ,  $K^{41}$  and  $Ca^{40}$  have been detd. The divergence from whole nos. is in no case so great as 0.1% of the mass measured. No difference in mass is detectable between the isobaric atoms  $Ca^{40}$  and  $A^{40}$  in spite of the 2 additional nuclear electrons in the latter. G. L. CLARK

The crossed-orbit model of helium, its ionization potential, and the Lyman series. L. SILBERSTEIN. *Nature* 111, 567(1923).—For the crossed circular orbit model of He proposed by Bohr the negative total energy is  $-E = 7N \alpha c h [1 - (1/4\pi) F(\sin i/2)]$ , where  $F$  is the complete elliptic integral,  $i$  the inclination of the planes (Bohr  $120^\circ$ ) and the other symbols are the usual universal const. The ionization work is therefore  $W = Nck(3-7F/4\pi)$  and the wave no. of the emitted flash is  $\nu = N[3 - (7/4\pi)F(\sin i/2)]$ . If  $i = 120^\circ$ ,  $F = 2.1565$ ,  $\nu = 1.7987 N$ ,  $N = 13.54 V$ , hence  $V$  (ionization potential) = 24.35 v. in close agreement with Lyman's new value of 24.5. For  $-\cos i = 1/2$ ,  $\lambda_\infty$ , the convergence wave length, is 506.8. Consideration of the dynamically possible states for other inclinations give the following:  $-\cos i = 1/2, 1/3, 2/3, 1/4$ , corresponding, resp. to  $\lambda = 537.2, 585, 522.9, 515.7$ , all checking closely with lines in the Lyman series. G. L. CLARK

Chemical combination and Sir Alfred Ewing's magnetic atom. A. P. LAURIE. *Proc. Roy. Soc. Edinburgh* 42, 352-61(1921-2).—L. considers the behavior of various atomic models in which the electrons have fixed positions (in shells) and behave as magnets. The magnetons may lie radially around the center of the atom: or more probably, tangentially. In the latter case, chem. combination is supposed to result from the lining up together in a radial direction of a valence magneton from each of 2 atoms. This means, if the magneton is an electron rotating in a small orbit, that the orbits of the 2 electrons become parallel. If the N and S poles of the magnetons in the original atoms are arranged in the same direction (e. g., counterclockwise) around the nucleus, the compound will not ionize; if the arrangement is opposite for the 2 atoms, the electron pair tends to be pulled into one atom, and ionization can thus occur. Metallic and non-metallic atoms should differ in the direction of the magneton poles. Experiments with a model to illustrate the combination of two atoms consisting of magnetons round a positive nucleus. *Ibid* 43, 72-84(1922-3).—The formation of a valence pair of magnetons as above is studied and it is concluded that this can occur when each atom has at least 2 additional external magnetons to stabilize the pair by their magnetic field. The valence and structure in typical org. compds. is accounted for, on this basis; this involves a new conception of unsatd. compds. Ionization is also dealt with. R. S. MULLIKEN

Coordination compounds and the Bohr atom. N. V. SUDGWICK. *J. Chem. Soc.* 123, 725-30(1923).—Bohr's recent atom-model, with specially arranged groups of electron orbits, makes it possible to bring the coordination compds. of Werner into line equally as well as org. compds. In most of the complex compds. of the metals of the eighth group with coordination No. 6, the no. of shared electrons is just sufficient to make the

total no. of electrons in the outer shells equal to that for the next-following inert gas. The dominance of the No. 6 corresponds to the groups of 6 electrons which appear in the next to outer shell of the Bohr atom at this region in the periodic system. The octet is here replaced by a group of twelve shared electrons (as has previously been suggested by Langmuir). The complex groups with coordination No. 4 differ from the preceding in the sharing of two less electrons (at the poles of the atom). The best known of the coordination compds. are covered by the above scheme; it is predicted however that various other types will be found, especially for metals not of the eighth group.

R. S. MULLIKEN

**Explanation of the theory of the rotation of the atomic nucleus.** I. HERBERG HENSHOCK. *Chem. News* 126, 262-6(1923).—This paper contains a general discussion of the nature (mode of formation, strength, etc.) of single, double, and triple bonds, and of valence in general, in terms of the author's theory (C. A. 17, 2076) of the rotation of the at. nucleus ("orientation of the atom kernel" would much more clearly indicate the author's meaning. ABSTR.). H. gives illustrations in terms of octet modes; each octet has 8 positive and 4 negative edges, the signs of the edges being controlled by the orientation of the kernel (nucleus plus 2 inner electrons). Combination of two like (or unlike) atoms takes place between oppositely charged edges, rotation of the atom-kernels occurring if necessary, and the kernels being at  $90^\circ$  in adjacent atoms in a compd. The alternating polarity of C chains, and the smoothness with which this establishes itself, are accounted for.

R. S. MULLIKEN

**Isotopes: a new relation concerning the periodic system of the atomic species.** W. D. HARRIS. *J. Am. Chem. Soc.* 45, 1426-33(1923).—The periodic system of the at. species, developed earlier by H., can be most simply represented as a network of lines, by plotting the isotopic no. ( $n$ ) against the at. no. ( $M$ ). Each intersection between lines corresponding to whole numbers represents a possible at. species. The order of frequency of occurrence of actual at. species is (1)  $M$  and  $n$  both even; (2)  $M$  and  $n$  both odd; (3)  $M$  even,  $n$  odd; (4)  $M$  odd,  $n$  even. A period of 2 in  $n$  is the rule, with a less marked period of 4. A period of 2 is also conspicuous in  $M$ , and appears in several other connections. Elements of even at. wt. (above at. no. 28) often have 4-7 values of  $n$ , while those of odd at. wt. never have more than 2. In most cases, for a given value of  $M$ , the  $n$  values differ by steps of 2. In every case where an even-numbered element has an isotope of odd isotopic no. (which also means odd at. weight), this isotope lies on the same line of const. isotopic no. and immediately between a pair of at. species of the same isotopic no. and odd at. no. Predictions are made as to the isotopes of certain elements; earlier predictions have since been exptly. verified.

R. S. MULLIKEN

**The movements of the earth's surface crust.** J. JOLY. *Phil. Mag.* 45, 1167-88 (1923).—The theory advanced is a recognition of radioactivity as the dominant source of energy which has controlled the surface history of the earth. Isostasy is the other controlling influence. J. shows how the two working together bring about the movements of the earth's crust through long periodic geological revolutions. For the details of the elaborate development of the theory one must be referred to the original.

S. C. L.

**The pitchblende (uraninite) of the Belgian Congo.** WILLY STRINKHULER. *Bull. soc. chim. Belg.* 32, 233-8(1923).—For quant. analysis the mineral is dissolved in  $\text{HNO}_3$ , and Pb, Se and Mo are pptd. by  $\text{H}_2\text{S}$ ; Pb, of which 6.39% is present, is detd. as  $\text{PbSO}_4$ .  $\text{U}_3\text{O}_8$  is pptd. from the  $\text{H}_2\text{S}$  filtrate by  $\text{NH}_3$ ; 87.8% is found to be present. 0.6% ( $\text{Co}_2\text{O}_3 + \text{NiO} + \text{Fe}_2\text{O}_3$ ), 0.32%  $\text{MoO}_3$ , 0.4% Se and 4.1% moisture are present.

R. BEUTNER

**Uranium V.** A. PICCARD AND E. STAHEL. *Physik. Z.* 24, 80-1(1923); cf. C. A. 16, 2068. —The conclusion of Hahn (C. A. 16, 2449), that there is no radioactive element U V, is contradicted. Later measurements of the residual activity after several months have shown that the half life is 34 days. Hahn's analysis of the decay curves of U X can give no evidence concerning the existence of U V, since the differences for U X and U X + U V do not exceed the exptl. error when a new product is examd. By using the originally proposed value for half life (48 days), Hahn's measurements would disprove the existence of U V. Control expts. on a new U X + U V prepn. of equal strength, gave the correct half period, 24.5 days, thereby proving that the residual activity was correctly measured.

W. F. FARAGHER

**An arrangement for measuring the strong ionization due to alpha rays.** Mlle. IRENE CURIE. *Compt. rend.* 176, 1462-4(1923).—In order to eliminate the danger of an unsatd. current, an app. is described that utilizes only part of the  $\alpha$ -rays. The active substance is covered with a round brass plate, which contains ten openings in the form of sectors. One or all of these can be left open according to the strength of the material

to be tested. The decrease in activity is const. for each sector and must be detd. for the app.

**A study of forked  $\alpha$ -ray tracks.** P. M. S. BLACKETT. *Proc. Roy. Soc. (London)* 103A, 62-78(1923).—The results are given of a careful analysis of *stereoscopic* photographs of C. T. R. Wilson cloud tracks of  $\alpha$ -particles. The points under investigation are (1) the lengths of the tracks of recoil atoms set in motion by  $\alpha$ -particles, which lead to a direct knowledge of the relation between the range and velocity for these recoil atoms; (2) the possibility of a detn. of the mass of the recoil atoms from accurate measurements of the angles of the forked tracks. By 2 different methods of calcn. B. succeeds in obtaining the range-velocity curves for the recoil atoms in the gases  $H_2$ , He, air, and Au. The range in air of a recoil atom of velocity between  $0.05$  and  $0.1 \times 10^8$  cm./sec. was found to be proportional to the square root of the at. no. of the atom. The ionization due to the 4 types of recoil particles was compared, and from this rough values for the av. charges carried by these particles were computed. The values obtained were 1.0, 1.5, 2.1 and 2.8, which are quite reasonable and in agreement with positive-ray data. It was also shown that the range variation for particles of a given velocity was not more than 15%. After developing the complete accurate geometrical theory leading to the evaluation of the angles  $\phi$  and  $\theta$  made by the  $\alpha$ -particle and by the recoil atom with the initial path of the  $\alpha$ -particle, this analysis is applied to the case of 3 clearly defined forks in  $O_2$ ,  $H_2$ , and He. From the evaluated angles it is possible to det. the masses of the 3 recoil atoms relative to the mass of the  $\alpha$ -particle taken as 4. In the 3 gases mentioned these are 16.72, 1.024, and 4.032, which is in agreement with the accepted values of the masses within the limits of accuracy of the measurements. The question of the max. loss of kinetic energy which could be detected by this method is also discussed.

**Photographic action of Becquerel rays.** ROBERT WÄLDER. *Sitzb. Akad. Wiss., Wien., Abt. IIa* 131, 495-510(1922).—A reversal was observed when a plate previously treated with  $\alpha$ -,  $\beta$ - or  $\gamma$ -rays producing a latent image, was exposed before developing to light from an ordinary lamp. The intensity of the reversed emulsion for increasing amts. of Ra rays and a const. amt. of light is represented by a U-shaped curve; and the same was observed with const.  $\beta$ - and  $\gamma$ -radiation and increasing amts. of light. With the amt. of light const. the intensity minima of the reversed emulsion for  $\beta$ - and  $\gamma$ -rays are of the order of magnitude of the energy of the absorbed Ra rays; while with  $\alpha$ -rays it is of appreciably greater energy. To account qualitatively for the results it is assumed that the AgBr in the emulsion acquires different amts. of energy by the absorption of rays: a part is split up and another part activated. The amt. of the AgBr broken up is greater, the greater the energy content of a ray. When the sepd. Ag absorbs energy it enters into a new compd. whose capacity for development is *not* less than the old.

**The gamma radiation of radium D and of radium E.** MILLER I. CURIE AND G. FOURNIER. *Compt. rend.* 176, 1301-5(1923).—The  $\gamma$ -rays of Ra D and Ra E are studied by means of an ionization chamber surmounted with a gold-leaf electroscope. Ionization curves are given for Ra D + Ra E and for Ra D and Ra E alone; intensity is plotted against g. of Al traversed per sq. cm. Ra D gives two groups of homogeneous  $\gamma$ -rays which have mass coeff. of absorption of 16.6 and 0.37, resp. Ra E gives a penetrating  $\gamma$ -radiation with a mass coeff. of absorption of 0.092.

**Luminescence centers and variations in gas pressure caused by electric discharges in spectrum tubes.** H. L. HAMBURGER. *Z. Elektrochem.* 29, 142-4(1923); cf. C. A. 15, 1459; 17, 1374.

**A theory of the abnormal cathode fall.** RESEARCH STAFF OF THE GENERAL ELECTRIC CO., LTD., LONDON. (Work conducted by J. W. RYDE.) *Phil. Mag.* 45, 1149-55 (1923).—According to the theory given, the conduction in the dark space is closely analogous to that in a high vacuum between a plane thermionic cathode and plane anode. The width of the dark space with given current and voltage should be detd. by the at. wt. of the gas and universal constants. The theory is compared with the measurements of Aston and of Aston and Watson. The relatively small divergence between the simple theory and expt. can be removed, partially at least, by taking into account the electrons liberated at the cathode, information concerning which is given by Cheney's measurements, and the collisions of the positive ions with neutral mols. It seems difficult to reconcile the theory with Aston's detn. of the variation of the elec. field through the dark space.

**Motions of electrons in gases.** H. A. WILSON. *Proc. Roy. Soc. (London)* 103A, 53-7(1923).—W. attempts to explain the apparent change in the free path of an electron with velocity in the same way as in earlier expts. (C. A. 17, 361), where he worked out

the deflection of an electron in passing through an atom consisting of a positive nucleus at the center of a uniform spherical shell of negative electricity of charge equal to that on the nucleus. He does this by multiplying Townsend's equation for the velocity of an electron (in a field  $X$ )  $v = 0.815 X e L / m c$  by a correction for the persistence of velocity of an electron after impact with such a mol.  $1/(1 \cos \Phi)$ . Here  $\cos \Phi$  is the av. value of the cosine of the angle of deflection  $\Phi$  of the electron by the field of the atom. He obtains this value of  $\cos \Phi$  as a function of  $R$  the radius of the negative spherical shell of the atom, and of a quantity  $k = -Ee/2T$ , where  $E$  is charge on nucleus,  $e$  that on the electron, and  $T$  is the kinetic energy of the electron from his earlier paper. The calcn. of the quantity  $1/(1 - \cos \Phi)$  shows it to vary from 1 to 0.5 and then to infinity as the ratio  $R/K$  goes from zero to infinity. Thus the initial decrease of this persistence from 1 to 0.5 factor would appear to produce an initial decrease in the electronic free path  $L$  given by the kinetic theory. Applying this equation to the expts. of Townsend on  $N_2$  and  $H_2$ , W. finds that the variation of free paths observed by Townsend are in fair agreement with those computed by his formula. In A where Townsend obtains free paths 15 times the accepted kinetic theory values the present theory is unable to account for the results.

L. B. LOEB  
The behavior of electrons in the inert gases. F. ZWICKY. *Physik Z.* 24, 171-83 (1923).—Z. attempts to explain the apparent change in cross section of the inert gases, A in particular, towards electrons projected at them with different velocities. His treatment (mostly mathematical) considers 3 essential cases. In the first the mols. are considered polarizable through the inductive action of the charge of the electron. This polarization deflects the electrons from their initial paths and causes an apparent increase in cross section of the mols. as the velocity decreases. Such an initial rise in the apparent cross section of the mols. with decreasing velocity has been observed in He and the order of magnitude of the effect observed is in fair agreement with that computed. In order to conform more to reality, and to treat the much greater variation of cross section shown by A, Z. takes the second case, in which, besides being polarized by the field of the electron, the atoms themselves possess poles. He considers the case of a quadrupolar atom first, and finds that while the apparent increase of cross section with speed is greater in the case above it is still not great enough to explain the results in A. By superposing the polarization induced by the electron on to the action of the quadrupole he obtains an increase in cross section which is less than with the quadrupole alone. He then points out that if the velocity of the electron becomes so low that it approaches the order of magnitude of that of the revolving electron in the atom such a quadrupole becomes essentially a dipole which is variable with time, as regards its action on the electron, while maintaining its quadrupolar behavior in other respects, e. g., the dielec. const. He shows that between one and ten v. velocities the electrons are in the vicinity of the atoms for periods that correspond to the periods of revolution of the electron in the atom. He then applies the analysis to the third case, that of an oscillating dipole whose period is comparable to the time of passage of the electron. He finds that the increase in apparent cross section for the atom now is much closer to the exptl. curve in A. He also finds that as the velocity is further decreased the apparent cross section begins to decrease, and can apparently fall to zero as the velocity approaches zero. This is very closely the actual behavior shown by A. The apparent decrease in cross section of the atom, which may sink below the kinetic theory value, then has the following interpretation. An electron moving straight toward an atom with a low velocity will have its path so altered by the revolving field of the atom that it will describe a spiral path whose diameter can become greater than that of the atom. In most cases such a deflection of the electron would give the atom an apparently large cross section. However, in the case of A it seems likely that owing to a special case of symmetry after passing the atom the electron spirals back to its initial undeflected path, having thus gone around the atom without shooting through it. Thus the abnormal free paths of the electrons in A at low velocities may be explained in a natural manner requiring no penetration of the atom by slow electrons.

L. B. LOEB  
Theory of the electric arc. K. T. COMPTON. *Phys. Rev.* 21, 266-91 (1923).—The fundamental phenomena of the arc are the cathode fall of potential and the copious emission of electrons from the cathode. The escape of an adequate supply of electrons is made possible by sufficient ionization of the gas near the cathode to form a positive space charge. The calcns. of C. support this view and indicate that the thickness of the region of the cathode drop is of the order of the electronic mean free path in the gas. J. J. Thomson first suggested that this emission of electrons is of thermionic origin. C.'s computations indicate that the thermionic emission from the cathode is sufficient



to account for the observed primary arc currents. The evidence favors the thermionic theory rather than the photo-elec. and canal-ray theories of the origin of the electronic emission. The current carried by the positive ions is also calcd. Ionization occurs in the region between the electrodes of a C arc in sufficient amt. to neutralize the space charge due to the electrons. Reasons are given for concluding that this ionization is primarily of thermal origin and not due to emission from the anode or ionization by collision. The anode drop of potential is accounted for in a qual. way by a deficiency of positive ions near the anode due to decreased recombination. Thermionic emission from the anode may also play a part.

L. M. HENDERSON

Photoelectric conductivity in its broader significance. B. GUDNEN AND R. POHL. *Physik. Z.* 23, 417-20(1922).—Expts. are described on individual crystals of insulating substances tending to develop further previous views (C. A. 16, 1535, 3434), on the relation of photoelec. cond., electronic conduction, and the dispersion and absorption of light in solids. With no dark current, the current in light of const. intensity at once assures a finite value, termed the primary current  $I_p$ , and distinguished from the subsequent secondary current  $I_s$ , which tends to stationary value. The  $I_p$  becomes satd. with increasing potential gradient; the satn. value is strictly proportional to the incident light energy, and to the thickness of the crystal. The form of the satn. curve is independent of the wave length operative, and of the direction of the elec. field. The independence of wave length corresponds to a close connection with dispersion, and indicates that the denominator in the dispersion formula  $n^2 = 1 + \Sigma \{D_h / [1 - (T_h/T)^2]\}$  is the detg. magnitude, the so-called dielec.-const. of the ionic species  $h$ . A table is given showing the connection between the photo-elec. satn. current and the refractive index for a no. of cryst. substances—insulators or half-conductors. Further, for diamond, zinc blende, and cinnabar, the following relation of photoelec. cond. to light adsorption was proved with tolerable exactness; the spectral sensitivity, i. e., quantity of photoelectricity per energy incident, rises slowly for the long waves, reaches a more or less sharp max. at the optical absorption boundary, falls steeply off for the short waves. More significant is the spectral distribution referred to absorbed energy. From the optical absorption boundary the true sensitivity rises in linear proportion to the wave length toward the long waves. Within limits of exptl. error as many coulombs of electricity are indicated per cal. absorbed light as correspond to the relation of 1 electron per each quantum  $h\nu$ . Hence, light absorption in solids is a quantum process. But no explanation is available for the sudden fall of the photo-elec. yield in the actual absorption max. In the discussion the possibility of traces of metallic impurities playing a part as in phosphors, was raised.

S. E. SHEPPARD

The mechanism of photoelectric conductivity. F. KAMPF. *Physik. Z.* 23, 420-3 (1922).—Although it is generally accepted that photoelec. conduction is an electronic process, some of the criteria put forth are not conclusive. Absence of a polarization current was assumed to go with electronic conduction; but a polarization current can be shown with S. Nor can the satn. current be regarded as a criterion, since electrolytes, e. g., in solns. in ethyl ether and hexane, show a satn. current. More cogent is the unipolar nature of the conduction, which shows that the current is principally due to negative carriers. Examples with HgS are given. The potential distribution may be explored and mapped as in gases. In HgI<sub>2</sub> K. finds the electron mobility per volt/cm. about 2.9 cm./sec., which is about  $1/10$  that of metals. The bases of the calcn. for this are discussed.

S. E. SHEPPARD

The penetration of cathode rays in molybdenum. D. L. WEBSTER AND A. E. HENNINGES. *Phys. Rev.* 21, 301-11(1923).—The av. depths reached by cathode rays penetrating Mo were detd. indirectly by measuring the absorption of the emerging X-rays and calcg. back to obtain the mean depth of production of the X-rays. The mean depth of production of the X-rays is approx. equal to the av. depth of penetration of the Mo target by the cathode rays at the given voltages. The voltages needed to make the mean depth of excitation of the K absorption limit frequency equal to 1, 2, and 3 $\mu$  were found to be 24, 44, and 67 kv., resp. A definite time exposure method of measuring ionization currents is described.

L. M. HENDERSON

The liberation of secondary rays by the passage of canal rays through solid bodies. J. HAHN. *Z. Physik* 14, 355-68(1923).—The secondary rays liberated when canal rays from H pass through thin gold foil was investigated. The curve showing the relation between the applied voltage and the no. of secondary electrons liberated by a canal ray is very similar to the curve showing the relation between the no. of electrons liberated from a hot body and the temp. If in Richardson's formula for the discharge of electricity from hot wires, the satn. current is replaced by the no. of secondary electrons for one primary ray and the temp. is replaced by the kinetic energy of the incident

particles, then one gets  $N = AE^{1/2} - (B/E)$ , where  $N$  = the no. of secondary electrons,  $E = eV = 1/300^2$  = the energy of the incident particles. An application of this equation to the observations shows that it represents the facts. Hence the relation between the no. of electrons liberated and the velocity of the canal rays is very similar to the relation between the no. of electrons emitted by a hot body and its temp. A positive secondary radiation was associated with the liberation of secondary electrons. This is due to the atomization of the gold by the canal rays. In the measurement of the velocities of the secondary electrons it was found that the smaller velocities occurred most frequently and the higher velocities less frequently. With increasing velocity of the primary canal rays the percentage of electrons of small velocity decreased while the percentage with higher velocity increased. Yet most of the electrons had small velocities. A comparison of the no. of electrons liberated on the side at which the canal rays entered and on the side at which they emerged showed that this ratio increased as the voltage applied to the tube increased and became nearly unity for voltages between 25,000 and 30,000 v.

A. W. S.

**The interior of a star.** A. S. EDDINGTON. *Nature* 111, suppl. No. 2793, v-xii (1923).—The tendency toward a balance between light pressure and gravitation results in an approx. constancy in the masses of the stars. Ionization is so great in the hot stars that the av. mol. wt. (taking free electrons into account) is between 3 and 4. The absorption coeff. of this ionized gas must be high to account for the relatively slow radiation from the surface. This low coeff. is due to the slowness of recombination of ions with electrons; such recombination occurs only when an electron hits the nucleus of an ion. The above statements should hold irrespective of what elements, except H, are present in the stars. This result is thus contrary to the theory that the heat of the stars is largely due to the combination of H to He.

R. S. MULLIKEN

**X-ray diffraction effects from liquids and liquid mixtures.** R. W. G. WYCKOFF. *Am. J. Sci.* 5, 455-64 (1923).—Photometric results are given of the X-ray diffraction patterns from the following pure liquids and their 1:1 (by vol.) mixts.:  $C_6H_6$  and  $CCl_4$ ,  $CH_2I_2$  and  $CCl_4$ , glycerol and  $H_2O$ . Curves are also given for  $H_2O$  and concd. aq. solns. of  $KCl$  and  $(NH_4)_2Fe(SO_4)_2$ . These measurements are in agreement with the assumption that the pattern of a liquid mixt. is the sum of the diffractions of its component liquids. The various hypotheses concerning the source of the bands in "liquid patterns" are mentioned and it is pointed out that the present expts. favor an origin *within* rather than *between* mols. but do not exclude the possibility of their arising from characteristic associations of mols.

RALPH W. G. WYCKOFF

**The reflection of X-rays by certain unusual lattice planes of calcite.** CH. MAUGUIN. *Compt. rend.* 176, 1331-4 (1923).—The exptl. interplanar spacings for the  $31\bar{1}$ ,  $5\bar{1}1$  and  $31\bar{3}$  planes, resp. 2.27, 1.47 and  $1.64 \times 10^{-8}$  cm., are twice as great as those calcd. from the formula for the calcite rhombohedron,  $d_{hkl} = 3.85 \sqrt{p^2 + q^2 + r^2 - 2(pq - qr + rp)\cos 78^\circ 51'}$ , where  $p$ ,  $q$  and  $r$  are Miller indices. This discrepancy is caused by the O atoms, which are not distributed with the same periodicity as C and Ca atoms. This constitutes a confirmation of the original interpretation of the at. arrangement in calcite crystals made by the Braggs.

G. L. CLARK

**The reflection of X-rays from the fluorite crystal.** MITSUO YAMADA. *Sci. Repts. Tohoku Univ.* 11, 447-53 (1923).—The anomalously strong third-order reflection from the 100 planes of fluorite (which supposedly should not appear because of alternate and equally dense layers of Ca and F atoms) may depend upon the much more compact arrangement of electrons in Ca atoms than in F. Hence with increasing glancing angle the X-ray reflection from F atoms decreases more rapidly than from Ca atoms, enabling a third-order reflection  $0.35/1.25 = 0.28$  (Y. has 0.08) as intense as the second order.

G. L. CLARK

**Calculation of crystal structure from röntgenograms.** H. C. BURGER. *Physica* 3, 121-6 (1923).—B. criticizes the existing methods of crystal structure detn. due to Debye-Scherrer, Runge, Johnson and Toeplitz, and Hull, and proposes some mathematical refinements tending to improve and systematize them. He excludes, for the present, the monoclinic and the triclinic systems.

A. P. H. TRIVELLI

**A hot-cathode Röntgen-ray tube for Debye-Scherrer photographs.** FRANZ WEYER. *Z. Physik* 14, 410-2 (1923).—A simple Röntgen-ray tube is described. It is made of a brass tube 60 mm. in diam. and 300 mm. in length and is completely surrounded by a lead jacket for cooling. It is provided with 2 or more Al windows which are only a distance of 10 mm. from the focal spot. Fe, Cu, Pd and Mo have been used for the anticathode which was water-cooled. The hot cathode was carried by a glass tube which was ground into the metal tube. This glass tube was provided with a side tube which was

connected to the pump. The hot cathode was a W wire 0.2 mm. in diam., wound in the form of a cone or a cylindrical spiral. The focus was exceptionally sharp. Hg vapor was kept out of the tube by means of a trap at low temp. The tube operates on 10 to 20 milliamps. and from 45,000 to 50,000 v. A. W. S.

**The total reflection of X-rays.** A. H. COMPTON. *Phil. Mag.* 45, 1121-31 (1923).—Observed deviations from Bragg's law have been ascribed to refraction of X-rays entering the crystal. C. reviews all the evidence bearing on this and shows that the close agreement between theoretical values and those calcd. from exptl. data of Duane and Patterson (*C. A.* 15, 798) leaves little doubt of the reality of X-ray refraction. C.'s app. consists of an X-ray tube from which a beam is passed through two slits giving a width of 2 mins. of arc on to a crown-glass reflecting mirror, thence through another slit, the position of which is adjustable by a micrometer screw, into an ionization chamber. The angle of total reflection is then sought by changing very slightly the angle of the mirror, shifting the final slit a measured distance to receive the beam in the ionization chamber and plotting the glancing angle thus detd. against the ionization. Steep peak curves of the character to be expected were obtained; they fell off to zero rapidly on shifting through a small angle in either direction. It was also shown that the reflected energy is nearly equal to the incident. If the wave length is known the observed index of refraction (slightly less than 1) may be used to calc. the no. of electrons in the atom. The no. calcd. agrees with the at. no. within 5%, which is an independent method of proving this fact. S. C. LINN

**The blackening of a photographic plate by Röntgen rays and its application to the measurement of intensities.** A. BOUWERS. *Z. Physik* 14, 374-82 (1923).—The blackening of a photographic plate as a function of the time of illumination and as a function of the intensity was studied. It was found that the blackening produced by Röntgen rays can be expressed as a function of the time by the equation,  $Z = C \log [(t/\tau) + 1]$  where  $C$  and  $\tau$  are const.,  $t$  is the time of exposure and  $Z$  the blackening. This is the same formula which Busé found to express the blackening produced by ordinary light. For Röntgen rays the exponent  $p$  in the formula of Swartzschild  $Z = f(I^p t)$  is very nearly equal to unity. Hence the law of blackening may be written as  $Z = C \log [(t/\tau) + 1]$ . The const.  $C$  does not depend on the wave length but increases asymptotically as the time of exposure. By measuring photographically the intensities, the relation between the intensity of the Röntgen rays, the voltage and the current was investigated. A. W. S.

**Radioluminescence and radiophotoluminescence.** KARL PRIZBAM AND ELIZABETH KARA-MICHAÏLOVA. *Sitzb. Akad. Wiss. Wien., IIa Abt.* 131, 511-30 (1922).—Radiophotoluminescence is a property possessed by certain substances of glowing longer and more brightly when exposed to ordinary light after an initial treatment with Becquerel rays. This property is shown by kunzite, fluor spar, apatite, orthoclase, adular, wollastonite, scheelite and many tourmalines. An extended study of kunzite disclosed that the intensity of the luminescence on exposure to  $\beta$  and  $\gamma$  rays increases with the time up to a flat max. and then slowly decreases. With increasing time of exposure the total light emitted approaches a satn. value. The curve approx. parallels that for the change of the optical coefficient of absorption with time of exposure. The two curves are similar also to the curve showing the change in the total light of a Lenard phosphor with increasing metal content. The radiophotoluminescence of kunzite shows a similarity to the photoelec. effect in its dependence on the wave length of the incident light. The energy emitted as light is but a small fraction of the energy absorbed from the  $\gamma$ -rays or the incident light. HARRY B. WEISER

**The diffusion of photochemical radiant energy from the point of view of the potential theory.** ADOLPH HACKRADT. *Strahlentherapie* 12, 1005-14; *Physik. Ber.* 3, 344-5; *Chem. Zentr.* 1922, III, 103.—The Meyer-Bering process is criticized on account of the use of a chamber (filled with HI soln.) whose depth cannot be neglected. A theory of the photochem. decompn. of HI is developed. C. C. DAVIS

**Activation of chlorine.** G. L. WENDT, R. S. LANDAUER AND W. W. EWING. *J. Am. Chem. Soc.* 44, 2377-82 (1922).—By exposing  $\text{Cl}_2$  to light before treating with H. the period of induction was eliminated. This apparent activation lasted for several hrs. but was not permanent. That it was not a case of ordinary activation was shown by the fact that  $\text{Cl}_2$  could not be made to react in the dark with H. after exposure. The apparent activation seems due to photo-destruction of inhibiting impurities; in other words the pre-exposure functions as an induction period. A. E. STRAUB

**Sensitiveness to light of asphalt as a function of its degree of dispersion.** JACQUES ERRERA. *Trans. Faraday Soc.* (advance proof) 1923.—Asphalt, long known to be light-sensitive, may be resolved by solvents into 3 components;  $\alpha$ ,  $\beta$ , and  $\gamma$  asphalts,

of which only the last is sensitive to light. The sensitiveness of the asphalts of Judea and Trinidad may be increased by the resolution by solvents (Kayser), the pptn. by  $(C_2H_5)_2O$  from a soln. in  $CHCl_3$  (Farquhar), or the conversion of the inactive parts into the sensitive component (Valenta process). Raw Judean asphalt is a mixt. of substances in a state of mol. and colloidal dispersion, and the sensitive asphalt chiefly is that in the colloidal state. Hence, the mech. methods for the sepn. of colloidal soln. appeared to provide a new process of sensitizing asphalt. Expt. confirmed this suggestion and showed a max. sensitiveness in asphalt prepd. by the Kayser process. Sunlight seems to have a coagulating effect, for it confers insolv. toward solvents in which unexposed asphalt is sol.

C. E. K. MEES

The phenomena of polarization of light on single submicroscopic particles  $10^{-4}$  cm. in order of magnitude. MARIE A. SCHIRMANN. *Physik. Z.* 23, 441-4 (1922).—By using the Ehrenhaft plate condenser to suspend and orient single submicroscopic particles in a gas, in conjunction with an ultramicroscope, it is possible to demonstrate the polychroism as a dispersion effect; with sym. illumination of all sides of equally sym. single particles no polychroism occurs. In prepg. particles condensation methods were mostly used (evapn. by blast flame in a quartz tube and condensation) but in some cases elec. dispersion. Total extinction of plane polarized light in the directions of both symmetry planes perpendicular and parallel to the elec. vector of the incident beam indicates spherical particles. Such completely sym. particles were given by Hg, Au, Ag, Cu, Pt, one modification of S, Se, and Te (probably) and liquid oils. Incompletely sym. were I, Sn, Bi, solid paraffin and several forms of S, Se and Te. Zn dust was too fine for a decision. Incidentally it is concluded that "blue" sky light is actually polychroic, viz., green-blue + blue-violet. The importance of the polarization method for estn. of the shape and size of submicrons of the order  $10^{-5}$  cm. for various applications of colloid chemistry and physics is emphasized.

S. E. SHEPPARD

The blue glow. E. L. NICHOLS AND H. L. HOWE. *J. Optical Soc. Am.* 6, 42-53 (1922).—Certain oxides when heated, particularly by an oxy-H flame, to incandescence give a blue glow at temps. corresponding to the dull red heat of non-selective radiators. The present paper gives measurements of (1) the temps. of the glowing oxides, (2) the brightness of the temp. radiation proper, (3) the brightness of the blue glow itself distinct from the temp. radiation. This was sufficiently sepd. by an ammonio- $CuSO_4$  filter, from  $800^\circ$  down, above this giving both blue glow plus true temp. radiation (above  $0.45\mu$ ). Measurements are given for  $MgO$ ,  $BeO$ ,  $CaO-Al_2O_3$ ,  $SiO_2$ ,  $ZrO_2$  and  $CoO$ . The blue glow and similar luminescences occur for substances which are (1) inactive when excited by light or X-rays, (2) excited by cathode rays, and often by flames, (3) highly refractory, (4) white, i. e., transparent in visible spectrum. The luminescence is much affected by previous heat treatment, being destroyed by previous fusions of the oxide; it is more intense for excess than deficiency of O. It is attributed to alternating reduction and oxidation.

S. E. SHEPPARD

New bands in the silicon spectrum. ANGEL DEL CAMPO AND JOSÉ ESTALELLA. *Anales soc. españ. fis. quim.* 20, 586-8 (1922); cf. *Anales soc. españ. fis. quim.* 13, 98-106 (1913).—Seven new bands are described in the Si spectrum. They occur between 2255.85 and 2148.0 Å. and appear to be composed of lines of variable intensity. A complete list of the components of the Si spectrum is given.

L. E. GILSON

The total radiation of iron at high temperatures. RUDOLF HASZ. *Z. Physik* 15, 54-5 (1923).—The ratios of the total radiation of Fe to that of a black-body, at temps. between  $750^\circ$  and  $1200^\circ$ , were detd. and the results are shown by curves, the ratios at  $800^\circ$ ,  $1000^\circ$  and  $1200^\circ$  being 70, 85 and 90%, resp. In the range of temps. used, Fe follows very closely the general relation (for metals) between total emission, reflective power and sp. resistance, developed by Planck (*Berl. Ber.* 278, 1903) from theoretical considerations.

C. C. VAN VOORHIS

The alpha lines in the "K" series tungsten spectrum. CHARLES CROFUTT. *Proc. Iowa Acad. Sci.* 28, 117-8 (1921); cf. *C. A.* 13, 3073; 15, 798, 1454, 1654.—An abstract. The object was to obtain the  $\alpha_1$  line by means of the photographic method. The resolving power of the X-ray spectrometer was increased by using thin crystals, narrow slits a greater distance between the crystals and the photographic plate, and by working on the 2nd and 3rd orders. This made it necessary considerably to prolong the time of exposure, in one case 11 days continuous operation. The front slit was 0.005 cm. in width and the thickness of the crystal was 0.015 cm. The distance between the crystal and the plate holder was 60 cm. Since the  $\alpha_1$  line was not obtained on any of the plates the results seem to indicate that the intensity of the  $\alpha_1$  line is less than 0.1 that of the  $\alpha_2$  line, or it differs in wave length by less than 0.05%. It is entirely possible that it could be obtained under more favorable circumstances.

W. G. GABSSLER

Tests on the application of narrow-range filters in spectrophotometric investigations. III. Temperature measurement with color filters. ANDRŠ HNATEK. *Z. wiss. Phot.* 22, 92-7(1923).—Exposures were made on panchromatic plates through blue, green and red filters. From the relative intensities, as detd. by a photometer, the temp. was calcd. by comparison with similar exposures made on a source of known temp. Tests were made on the sun, incandescent lamps, and an arc lamp, and are deemed applicable to measurements on the fixed stars.

G. R. FONDA  
Photochemical study. XV. The problem of sight. I. PLOTNIKOV. *Z. wiss. Phot.* 22, 108-9(1923).—There is present in the eye a purple dye, rhodopsin, which is bleached in the light. Its various, possible reactions are considered. XVI. The invalidity of the photoelectric law for photochemical processes. *Ibid* 110-6.—A critical review is given of recent papers on photochemistry to demonstrate that their results are in accord with the photochem. absorption law of Grothuss-van't Hoff rather than with the Einstein formula.

G. R. FONDA  
Observations on the after-glow of active nitrogen. M. PIRANI AND E. LAX. *Wiss. Veröffentl. Siemens-Konzern* 2, 203-7(1922); cf. Strutt, C. A. 7, 3863; Baker and Strutt, C. A. 8, 2283.—From observations of the discharge through N contained in a glass vessel of 2 l. capacity, of a current of frequency about 100,000 cycles per sec., the authors conclude that the after-glow of active N is attributable to the presence of minute quantities of impurities, more especially of electronegative gases and vapors, *e. g.*, O, water, and I. Absolutely pure N does not exhibit the after-glow phenomenon. Rare gases and electropositive gases, *e. g.*, H, exercise very little influence upon the phenomenon. Electronegative gases produce the max. effect when present to the extent of about  $1.5 \times 10^{-3}\%$ . The effect is reduced when these gases are present to the extent of  $6-8 \times 10^{-3}\%$ . The phenomenon is attributable to the conversion of the N into an active modification, which is destroyed with the emission of light, in the presence of electronegative gases.

J. S. C. I.  
Application of the photochemical equivalence law to dilute solutions. HEINZ GRÖSS. *Z. Elektrochem.* 29, 144-50(1923).—In continuation of Noddack's work (cf. C. A. 15, 3589) it has been found that the photochem. reaction  $2\text{CCl}_3\text{Br} + \text{Cl}_2 + h\nu = 2\text{CCl}_4 + \text{Br}_2$  in a medium of  $\text{CCl}_4$  is independent of the concn. of the  $\text{CCl}_3\text{Br}$ , at least up to dilns. of  $1/40$  in the latter and to  $1/100$  in the former solvent. Pure  $\text{CCl}_4$  is not an acceptor of Cl under the influence of light. The reaction  $2\text{CCl}_3\text{Br} + \text{O}_2 = 2\text{COCl}_2 + \text{Br}_2 + \text{Cl}_2$  can be sensitized by illuminating the Br which is produced by the reaction. This autosenitization is independent of the concn. of  $\text{CCl}_3\text{Br}$  and  $\text{O}_2$  in the  $\text{CCl}_4$ . Einstein's photochem. law applies to the reaction and 1 mol. Br is formed per quantum of illumination. The results of the investigation indicate that combination takes place between  $\text{CCl}_3\text{Br}$  and illuminated Cl mols. characterized by a large Bohr quantum no., without previous dissociation into atoms. A value of  $10^{-1}$  sec. has been calcd. for the period of existence of the mols. in the Bohr state.

H. JERMAIN CREIGHTON  
The basis of Einstein's equivalence law and its meaning in photochemical and chemical processes. FRITZ WEIGERT. *Z. Physik* 14, 383-409; *Physica* 3, 113-20(1923).—The photochem. equiv. law of Einstein has as a basis an ideal, completely reversible, photochem. reaction. It leads to a condition for stable photochem. equilibrium and moreover to the well known equation  $Q = Nh\nu$ . This equation states that in a normal photochem. transformation  $N$  units of energy must be absorbed and also expresses the relation between the heat of reaction and the frequency  $\nu$ . It points to the impossibility of stable photochem. equil. unless the density of the radiation corresponds to the temp. of the cavity in which the reacting system is placed. Hence the equiv. law holds only for the primary photochem. process in the form  $Q = Nh\nu$  and it states nothing concerning the heat of reaction for the entire reaction. When a consideration of the density of the radiation which is in equil. with the system at the temp.  $T$  is pushed aside, photochem. equil. does not differ from ordinary thermodynamical equil. Purely chem. processes can under these conditions be considered as photochem., so that for each molar chem. or photochem. process  $N$  units of energy must be absorbed. The resulting expression is identical with that given by van't Hoff and Arrhenius for the dependence of chem. equil. on the temp. This equation forms the basis of the radiation hypothesis of chem. processes.

A. W. S.  
Inhibition of the photochemical decomposition of hydrogen peroxide solutions. II. WM. T. ANDERSON, JR. AND H. S. TAYLOR. *J. Am. Chem. Soc.* 45, 1210-7(1923); cf. C. A. 17, 1755.—Tables summarizing the inhibiting effect of various inorg. acids, bases, and salts are given. Bases were found to be excellent inhibitors, acids good, and neutral chlorides and bromides fair. The inhibition was shown by neutral salt action

to be a function of concn. of H, OH, Cl and Br ions. The facts with which any theory of mechanism must accord have been outlined and a qual. approximation to a theory of mechanism, based on the ionization of the  $H_2O_2$  has been described. E. P. W.

**Influence of light on inorganic matter and life processes.** OSKAR BAUDISCH. *Ind. Eng. Chem.* 15, 451-4(1923); cf. preceding abstract.—The nature of light and of chem. changes brought about by light are discussed in a general way. Recent work in the field of photochem. action on both inorg. matter and on org. processes is reviewed.

E. P. WIGHTMAN

**Luminous pulsations in the glow of phosphorus.** H. P. WARAN. *Phil. Mag.* 45, 1132-9(1923).—In order to compare his results with those of Rayleigh (*C. A.* 15, 3938) W. describes minutely the app. in which he observed periodic flashes on admitting electrolytic O in small bubbles into a glass system contg. P deposited on the walls by vaporization. He shows that the periods differ in different parts of the app., depending on their vol. and shape. He differs from Rayleigh in finding that  $H_2O$  has little influence. The theory advanced by W. assumes explosive mixt. of P vapor and O to be necessary for the luminous phenomena observed. The time necessary for the formation or re-establishment of this crit. explosive mixt. regulates its periodicity. S. C. LUND

**Researches in the cathodic phosphorescence of ruby.** J. ROSSIGNOL. *Compt. rend.* 176, 1459-62(1923).—The effect of electrons of various speeds on mixts. of  $Cr_2O_3$  and  $Al_2O_3$  spread on glass plates was observed. A curve is shown of  $1/\sqrt{t}$  against time, where  $I$  is the intensity of luminescence. In the ruby spectrum the two fundamental red lines,  $R_1$  and  $R_2$ , are lines of resonance. M. FARNSWORTH

**Photochemical studies. I. Photochemical decomposition of solid oxalic acid.** W. ALBERT NOYES, JR. AND A. B. KOUPERMAN. *J. Am. Chem. Soc.* 45, 1398-1400 (1923).—Anhydrous oxalic acid is decomposed by wave lengths 100 to  $250\mu$ . The rate is greater for shorter wave lengths. The velocity is much increased by the presence of  $H_2O$ . There is a long induction period followed by const. velocity. Possible explanations of the induction period are discussed. The wave length necessary to decompose the solid acid does not agree with that calcd. from Perrin's formula based on a rough detn. of the temp. coeff. of the rate of thermal decompn. E. P. WIGHTMAN

**Photochemistry of potassium permanganate. I. Application of the potentiometer to the study of photochemical change.** E. K. RIDEAL AND R. G. W. NORRISH. *Proc. Roy. Soc. (London)* 103A, 342-66(1923).— $KMnO_4$  soln., on illumination by ultra-violet light, undergoes a marked change of electrode potential, which reverts slowly to its original value in the dark. This change is due to an alteration in the  $pH$  of the soln. brought about by photochem. decompn. of  $KMnO_4$ , which is apparent by the sepn. of a brown ppt. of the formula  $K_2O \cdot 2MnO_2$ , and the formation of a red sol. of  $MnO_2$  and potassium manganite. The potential changes can be explained by the production of KOH in the soln. and its removal by combination with the hydrated  $MnO_2$ ; as a result, a photochem. stationary state ensues. The decompn. is mono-molecular. It was found possible to calc. the velocity const. by two independent methods from the electrode potential. The values were in good agreement among themselves, and with the const. detd. by direct analysis. The addn. of  $H_2SO_4$  to the  $KMnO_4$  was found to hasten decompn. and to impose a zero mol. law of decompn. on the soln. This change in type was shown to be connected with the non-formation of colloid in the acid soln. Various substances were examd. for photoactivity by the potentiometer method; among these  $NH_4NO_3$ ,  $UO_2(NO_3)_2$ , and  $KClO_4$  gave definite positive results. E. P. WIGHTMAN

**New experiments on photophoresis.** J. MATTAUCH. *Physik Z.* 23, 444-8(1922).—A new construction of the app. for studying photophoresis is described. The following principal results were obtained. With Se there exist two quite different modifications, either of which can be obtained as desired. Both positively and negatively photophoretic examples of these modifications occur. For one, all of the particles of radius greater than  $17 \cdot 10^{-6}$  cm. are photopositive, all below this down to  $10 \cdot 10^{-6}$  cm. photonegative. Below this the sign of the photophoresis could not be exactly detd. For the other, all particles observed were negatively photophoretic. With this app., the parts played by radiometer effects and radiation pressures could be distinguished.

S. E. SHEPPARD

**The photochemical decomposition of solid bodies.** W. ALBERT NOYES, JR. *Compt. rend.* 176, 1468-70(1923).—An equation for the decompn. of solids is briefly derived from that for gases by consideration of the additional energy required to sep. mols. and to remove the products of decompn. from the surface. G. R. FONDA

**Action of light on emetics.** VOIRMAR. *Compt. rend.* 176, 1465-7(1923).—Radiation from a quartz Hg vapor lamp decomposes compds. of the type  $HO_2CCH(OH)CH(ORbO)CO_2K$  more readily than the tartrates.  $CO$ ,  $CO_2$  and  $H$  are liberated and

the metal either as such, as in the case of Sb, As and Bi, or as an oxide, as with Cu and Fe.

G. R. FONDA

Apparatus for demonstrating the paths of  $\alpha$ -rays (LAKEMAN, SISSINGER) 1. A new method of crystal analysis and the reflection characteristic of X-rays (CLARK, DUANE) 2. Oxidations and reductions induced by uranium salts under the influence of light (ALOY, VALDIGUIÉ) 10.

BARKHAUSEN, HEINRICH: Elektronen-Röhren. I. Elektronentheoret. Grundlagen. II. Verstärkung Schwacher Wechselströme. Leipzig: S. Hirzel. 124 pp. CERMAK, PAUL: Die Röntgenstrahlen. Leipzig: J. A. Barth. 130 pp.

#### 4—ELECTROCHEMISTRY

COLIN G. FINK

Louis Bell. ANON. *Elec. World* 81, 1485(1923); 1 illus.—Obituary. C. G. F. The electrochemical industry of Norway. KNUDSEN. *J. four Electrique* 32, 79 (1923). C. G. F.

Problems encountered in electric furnace practice. P. E. MCKINNEY. *Trans. Am. Inst. Chem. Eng.* 12, 1, 19-22(1919).—Recommendations are given for obtaining the best results. The charge should be melted as rapidly as possible and CaO and sufficient ore added during melting to reduce the C to 0.05-0.10%. When reduced to this %, the slag is completely removed. For refining, ferro-Mn and CaO should first be added. A small amt. of CaF is then added to make the slag fluid, followed by the addn. of powd. ferro-Si and C on top of the slag close to the electrodes until a "white" slag contg. under 1% Mn (below 0.5% is practicable) is formed. Such a slag will absorb 1% of its own wt. of S and a metal can be desulfurized from 0.08% to less than 0.01%. All cooling should be done in the furnace and pouring should be very slow and final cooling as rapid as possible.

C. C. DAVIS

Electrical considerations of the electric furnace installation. N. I. TOWLE. *Trans. Am. Inst. Chem. Eng.* 12, 1, 23-8(1919).—A general discussion of the necessity of power factor limitation and close power input regulation for increasing production and lowering power charges.

C. C. DAVIS

Electric furnace production of cast iron. CLAUSER DE COUSSERGUES. *J. four Electrique* 32, 75(1923).—A review.

C. G. F.

An electric furnace for the melting of quartz goods. W. SCHUEN. *Keram. Rundschau* 31, 12(1923); *J. Soc. Glass Tech.* 7, 47; cf. *C. A.* 17, 2176.—Quartz was melted to a cylindrical mass round an electrically heated carbon tube. At the stage of development attained, only pieces of quartz so shaped could be worked and then by processes adapted from the glass industry. The elec. resistance consisted of a tube of 1 m. length, 35 mm. external diam., and 25 mm. internal diam., made of the purest electrode C. At each end of the tube an electrode consisting of a thick block of C was adjusted to make good elec. contact with it. The electrodes were surrounded by strong Fe bands, and the cables were joined to the electrodes by detachable strong Fe connecting pieces. The resistor and electrodes were built into a furnace capable of rotation. The furnace consisted of a strong Fe cylinder lined with a glazed fireclay cylinder. Asbestos was placed between the Fe shell and the electrodes to prevent short-circuiting. Only a. c. could be used. The voltage was 40 and the current 800 to 1000 amp. In 20 minutes 18 to 23 kg. of sand could be melted with a current consumption of 7.5 to 8 kw./hr. Sketches of the furnace are given. A piece of waste quartz tube was slipped over the carbon resistor. Sand was then filled in to such a height that the top electrode could not rest on the edge of the furnace hut rested on top of the sand. The silica and the carbon reacted, with the formation of Si carbide and CO<sub>2</sub>. Any gas developed could escape only with difficulty and so a protective layer was formed between the glowing resistor and the soft quartz. To counteract the high gaseous pressure, a hand-operated lever was used to maintain elec. contact between the resistor and the electrodes. The melting process was concluded in 20 to 30 minutes and then the quartz had to be worked quickly.

H. G.

High-frequency induction furnace. ANON. *Recherches et inventions* 4, 441-7 (1923).—Description of the construction and operation of the Dufour furnace.

A. PAPINEAU-COUTURE

Thirty-kilowatt fifteen-thousand-volt rectifier for the United States Navy. A.

SCHMIDT, JR. *Gen. Elec. Rev.* 26, 276-8 (1923).—The set-up of this rectifier is described with the aid of a schematic circuit diagram and several photographs. C. C. V. V.

BLATTNER, E.: *Lehrbuch der Elektrotechnik.* (I). Bern.: K. J. Wyss Erben. 423 pp.

BULL, H.: *Elektrisk metalsmeltning.* S. R. 4. Kristiania: H. Aschehoug & Co. Kr. 0.75.

**Primary electric battery.** M. L. MARTUS. U. S. 1,459,512, June 12. Structural features.

**Storage battery.** F. VAN DE WIEL. U. S. 1,459,121, June 19. Structural features of stopper and gas vents.

**Electrolyte for storage batteries.** H. ELLIS, P. S. HART and W. G. NUNNELLY. U. S. 1,459,659, June 19. An electrolyte such as  $H_2SO_4$  soln. is mixed with twice its amt. of oil, e. g., mineral lubricating oil, to prolong the life of the battery and avoid freezing.

**Apparatus for electrolytic reduction of metals.** AKTIESELSKAPET HOYANGFALDENNE, NORSK ALUMINIUM Co. Norwegian 36,452, Jan. 2, 1923. Furnaces for reduction of metals of higher sp. gr. than the bath are provided with one or more canals or pools in the bottom to collect the pptd. metal.

**Electric radiation furnace for reduction of zinc.** F. THARALDSEN. Norwegian 36,801, Feb. 12, 1923. The furnace described in Norwegian patent 34,947 (C. A. 17, 2394) is improved. The moving bottom is lined with graphite at the places exposed to an especially intensive heating.

## 5—PHOTOGRAPHY

C. E. K. MEES

**Size-frequency distribution of grains of silver halide in photographic emulsions and its relation to sensitometric characteristics.** V. Systematic correlation. E. P. WIGHTMAN, A. P. H. TRIVELLI AND S. E. SHEPPARD. *J. Phys. Chem.* 27, 466-86 (1923); cf. C. A. 17, 1596.—A series of photographic emulsions has been prepd. of which a correlation between the grain and sensitometric characteristics shows an apparently close relationship between the two. These emulsions are strictly comparable because practically all the factors in their prepn. were under control, only one being varied so as progressively to increase the speed of the emulsions in the series, and because equal wts. of emulsion contg. in every case the same amt. of Ag halide by wt. were coated on the plates. The equations which represent the grain-size distribution of these emulsions show a steady transition from a steep exponential,  $y = y_0 e^{-kx}$  to a flat, widely spread Gaussian type  $y = y_0 e^{-k(x-\alpha)^2}$ . That is to say, in passing through the series from the slow to the comparatively fast emulsion the parameters  $y_0$  and  $k$  steadily decrease, while the parameter  $\alpha$ , which is 0 in the first 2 examples, then steadily increases.

E. P. WIGHTMAN

**The amount of displacement in gelatin films shown by precise measurement of stellar photographs.** C. DAVIDSON. *Optician* 65, 285-90 (1923).—The work of others is reviewed. Distortion on glass plates was found exceedingly small, of the order of 0.001 mm. In films, on the contrary, large distortions were found, and a general shrinkage of the order of 1%.

C. E. K. MEES

**Preparation of metol.** W. F. A. HERMEN. *Phot. J.* 63, 223-9; *Chemistry & Industry* 42, 486-7 (1923).—By the action of heat on *p*-hydroxyphenylglycine,  $MeNH_2$  and a tarry residue are produced instead of  $CO_2$  and  $MeNHC_6H_4OH$ , as claimed by Paul. Similar results were obtained by heating under pressure, and in a vacuum, as well as with lime or soda, but a smooth reaction was obtained by heating with a large excess of phenol. By direct methylation of *p*-aminophenol the main product is  $Me_2NC_6H_4OH$ . A method for the estn. of mixts. of *p*-aminophenol and *p*-methylanilino-phenol is indicated, depending on the amt. of nitrite soln. required to form the nitroso deriv. of the methylaminophenol and diazotize the primary amine. Reference is made to the formation of methylaminophenol from hydroquinone and  $MeNH_2$ ; material so prepd. is extremely poisonous, whereas the product formed by the action of  $Me_2SO_4$  upon benzylaminophenol is entirely innocuous. "Metol poisoning" is ascribed to the presence of *p*- $C_6H_4(NHMe)$ , which is shown to be a powerful vesicant.

C. E. K. MEES

**A new direct method of cold sulfide toning.** W. B. SHAW. *Brit. J. Phot.* 70, 267-9 (1923).—Prints tone rapidly in a sulfide soln. to which an aromatic nitro deriv.



has been added. The formula adopted is: soln. *A*  $\text{CaCl}_2$  (cryst.) 30 g.,  $\text{NH}_4\text{Cl}$  10 g.,  $\text{NH}_4\text{OH}$  (d. 0.88) 10 cc.,  $\text{PhNO}_2$  10 cc.,  $\text{H}_2\text{O}$  1000 cc. and soln. *B*  $\text{Na}_2\text{S}$  (cryst.) 10 g.,  $\text{H}_2\text{O}$  100 cc. For use, 5 cc. soln. *B* are added to every 100 cc. of soln. *A* taken. The tones obtained are identical with those given in polysulfide toning; they are colder than those given by hypo alum or by bleaching and sulfiding. C. E. K. MEES

An adaptation of the thalofide cell to the measurement of photographic densities. A. L. SCHOEN. *J. Optical Soc. Am.* 7, 483-90(1923).—To measure low densities with great accuracy the usual visual methods are inadequate. Tests made with thalofide cells to det. the conditions for high sensitivity and stability show that this instrument can be adapted as a phys. photometer for the measurement of these densities. Changes in sensitivity with applied voltage and intensity of illumination were observed. From these data the best voltage and illumination were detd. and maintained const. on the cell. Densities were detd. (the inverse square law being used) by moving the source of illumination to produce zero deflection in a sensitive galvanometer for each step of the sensitometric strip. Results indicate that this method can be used with advantage in problems involving the measurement of very low densities and small density differences and that densities as low as 0.005 (98.8% transmission) can be measured with a fair degree of certainty. A. L. SCHOEN

Fundamental problems of the photographic plate. I. The diverse action of light on the photographic plate. EMILE MUELSTEIN. *Arch. sci. phys. nat.* 4, 430-48 (1922). II. Résumé of theories of the latent image. *Ibid* 5, 37-58(1923). III. Sensitivity and structure of the photographic plate. *Ibid* 5, 110-28.—A review with good bibliography up to 1921. Cf. *C. A.* 16, 2255. E. P. WIGHTMAN

Blue tones by development. W. ERMEN. *Brit. J. Phot.* 70, 47-8(1923).—Various indophenols can be produced by the oxidation of mixts. of amines and phenols. If the amines are used for development in the presence of phenols and the indophenol produced is insol. it will be deposited with the silver image, thus giving a colored deposit. The following formula gives blue tones by this process: dimethyl-*p*-phenylenediamine 6 g.,  $\text{Na}_2\text{SO}_4$  (crystals) 20 g.,  $\text{Na}_2\text{CO}_3$  (crystals) 20 g.,  $\text{H}_2\text{O}$  to 1000 cc. To 100 cc. of this developer add 33 cc. of the following solution:  $\alpha$ -naphthol 14.4 g.,  $\text{NaOH}$  8.0 g.,  $\text{H}_2\text{O}$  to 1000 cc. C. E. K. MEES

Dr. Surry's new artistic procedure. C. DUVIVIER. *Camera* (Luzern) 1, 172-4 (1923).—This is a dusting-on process using paper sensitized in a 5%  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$  bath. Exposures are made with a fine white cloth screen between the negative and the paper. A bluish light-sensitive layer previously coated on the paper serves as an exposure guide and is later decolorized in 8%  $\text{HCl}$ . Paper so prepd. is sold under the name "Color." C. E. K. MEES

The blackening of a photographic plate by Röntgen rays (BOUWERS) 3. Photographic action of Becquerel rays (WÄLDER) 3.

Moving picture projection screen. C. A. PROTON and J. G. BRUYERE. U. S. 1,459,603, June 19. A fabric for projection screens is woven of mixed textile and metallic threads, e. g., Cu or silvered or gilded wire, and the woven fabric is rolled to crush the metallic threads.

## 6—INORGANIC CHEMISTRY

H. I. SCHLESINGER

Residual affinity and coördination. XVI. Normal and acid salicylatotetramminocobaltic salts. GILBERT T. MORGAN and J. D. MAIN SMITH. *J. Chem. Soc.* 123, 1096-1108(1923); cf. *C. A.* 17, 1952.—The analogy of the salicylatocobaltamine to Na (*C. A.* 17, 939) is further shown by the prepn. of insol. salts, but it breaks down completely in reference to the property of forming stable acid or H salts, which is possessed in a far greater degree by the cobaltamine than by the alkali metal. Of the 25 normal salts examd., in every case 1 mol. of firmly held  $\text{H}_2\text{O}$  is present for each mol. of the complex cation. Of the 22 H salts examd., 11 are completely anhyd. and of the remainder, 5, although contg.  $\text{H}_2\text{O}$ , are less hydrated than the corresponding normal salts. The following salicylatotetramminocobaltic salts are described: *Dihydrogen pyroantimonate*, cryst. pink powder with  $12\text{H}_2\text{O}$ , which loses  $3\text{H}_2\text{O}$  upon drying 10 days over  $\text{CaCl}_2$  and then loses 0.5 of the remaining after 7 hrs. at  $100^\circ$ . *Dihydroxytartrate*, with  $2\text{H}_2\text{O}$ , damask-red; the soln. reduces cold  $\text{NH}_4\text{OH}-\text{AgNO}_3$  and hot  $\text{HgCl}_2$  and  $\text{HgCl}_4$ . *Mesoxalate*, with  $4\text{H}_2\text{O}$ , violet-red. *Nitrite*, with  $1\text{H}_2\text{O}$ , red, stable in air.

the aq. soln. gives no ppt. with "nitron" acetate but readily diazotizes  $\text{PhNH}_2\cdot\text{HCl}$ . *Phosphite*, with  $4\text{H}_2\text{O}$ , damask-red, stable in air; the soln. reduces  $\text{NH}_4\text{OH}\cdot\text{AgNO}_3$  and converts  $\text{HgCl}_2$  into  $\text{HgCl}$ . *Pyrophosphate*, with  $18\text{H}_2\text{O}$ , damask-red. *Thiosulfate*, with  $4\text{H}_2\text{O}$ , violet-red, from which acid liberates S and  $\text{SO}_2$ . *Dithionate*, with  $4\text{H}_2\text{O}$ , brilliant violet. *Tetrathionate*, with  $2\text{H}_2\text{O}$ , violet-red. *Cobalticyanide*, violet-red with  $4.5\text{H}_2\text{O}$ . *Diamminocobaltinitride*, with  $2\text{H}_2\text{O}$ , golden brown. *Chloroplatinate*, with  $4\text{H}_2\text{O}$ , reddish brown. *Hydrogen oxalate*, bright scarlet. *Hydrogen phosphite*, dark red, the soln. of which is acid to phenolphthalein, but not to methyl orange or bromophenol blue. It has reducing properties. *Dihydrogen pyrophosphate*, pale rose pink, with  $4\text{H}_2\text{O}$ . *Hydrogen bisulfite*, chocolate brown, decomp. in  $\text{H}_2\text{O}$  giving a ppt. of  $\text{BiI}_3$ . *Hydrogen sulfate*, bright brick-red, with  $2\text{H}_2\text{O}$ , stable in air and giving a strongly acid soln. *Hydrogen dithionate*, with  $1\text{H}_2\text{O}$ , bright red, or brouzy-violet prisms from dil.  $\text{EtOH}$ . *Hydrogen tetrathionate*, brilliant red, giving a violet-red soln. with alkalis. *Hydrogen dichloride*, with  $2\text{H}_2\text{O}$ , bright red, highly deliquescent product, forming a red liquid in the air and solidifying to the normal Cl. The normal salt was also obtained by adding  $\text{CaH}_2\text{N}$  to the concd. aq. soln. *Hydrogen dibromide*, dark red, with  $1\text{H}_2\text{O}$ . *Hydrogen mercurichloride*, dark red. *Mercuribromide*, brownish red. *Mercuriodide*, brilliant purple-black. The acid red solns. of these 3 halides are rendered purple by alkali and yield white ppts. with  $\text{NaOH}$  or  $5\text{N NH}_4\text{OH}$ . *Hydrogen cobalticyanide*, glistening rose-pink, giving a strongly acid aq. soln. *Hydrogen chloroplatinate*, brownish red, yellow by transmitted light; it does not evolve  $\text{HCl}$  with cold concd.  $\text{H}_2\text{SO}_4$ .

C. J. WEST

**Alkaline earth selenides.** F. A. HENGLEIN AND R. ROTH. *Z. anorg. allgem. Chem.* 126, 227-36 (1923).—The Ca, Sr and Ba salts were prepd. by reduction of the selenates in  $\text{H}_2$ . The following precautions were found necessary: the decompn. temp. must not be much exceeded; the current of  $\text{H}_2$  must be rapid to remove water quickly; the selenates must be very finely powdered. About 1 g. of selenate was placed in a  $10 \times 1$  cm. porcelain boat; for this amt. the time required for complete reduction was about 3 hrs. No action was observed on the porcelain. Temps. of reduction were: Ba,  $500^\circ$ ; Sr,  $600^\circ$ ;  $\text{CaSeO}_4$  was reduced even at  $400^\circ$ , indicating apparently a different inner structure. The products were pure white and had a selenide content of 95-98%. In air they become red in a few min., bright-brown in a few hrs., and dark-brown after some days. Similarly  $\text{PbSe}$  was prepd., gray-black with bluish sheen. Attempts were made similarly to reduce the tellurates. They retain water obstinately and require preliminary heating to  $400^\circ$ . The temps. of beginning reduction in  $\text{H}_2$  were: Ca,  $410^\circ$ ; Sr,  $360^\circ$ ; Ba,  $310^\circ$ . The tellurides decompd. in  $\text{H}_2$  and pure products could not be obtained. The densities of the selenides were measured in a simple form of volumometer the construction and calibration of which are described in detail. Found:  $\text{CaSe}$ , 3.57;  $\text{SrSe}$ , 4.38;  $\text{BaSe}$ , 5.02;  $\text{PbSe}$ , 8.07; whence mol. vol. =  $\text{CaSe}$ ,  $33.5 \pm 0.3$ ;  $\text{SrSe}$ ,  $38.1 \pm 0.4$ ;  $\text{BaSe}$ ,  $43.1 \pm 0.4$ .

A. R. M.

**Silica studies.** I. Loss of water of kaolin and its behavior in solid condition toward carbonates and oxides of alkaline earths. G. TAMMANN AND W. PAPER. *Z. anorg. allgem. Chem.* 127, 43-68 (1923).—These expts. were undertaken on account of the very conflicting nature of the conclusions of other investigators. Data and curves are presented which were obtained in expts. on slimed and carefully washed Oschatz earth dried at  $150^\circ$ . These include dehydration, rehydration of material heated to  $600^\circ$ , behavior of  $\text{BaCO}_3$  toward  $\text{Al}_2\text{O}_3$  and kaolin, behavior of  $\text{CaCO}_3$ ,  $\text{SrCO}_3$ ,  $\text{BaO}$ ,  $\text{CaO}$  and  $\text{SrO}$  toward  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$  and kaolin. Upon losing water at  $550^\circ$  kaolin decomposes into  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$  and water and at  $930^\circ$  the  $\text{Al}_2\text{O}_3$  released at  $550^\circ$  changes into another form less sol. in acids. These conclusions are based on the following evidence: (1) After loss of water at  $550^\circ$  the  $\text{Al}_2\text{O}_3$  of kaolin is sol. in acids. (2) Heating to  $800$ - $900^\circ$  renders both pure  $\text{Al}_2\text{O}_3$  and that of kaolin difficultly sol. in acids. (3) Pure  $\text{Al}_2\text{O}_3$  evolves notable amts. of heat between  $850^\circ$  and  $1060^\circ$ ; kaolin at  $930^\circ$  evolves an amt. of heat which is proportional to its content in  $\text{Al}_2\text{O}_3$ . (4) After this evolution of heat the  $\text{Al}_2\text{O}_3$  becomes denser and the kaolin shows a distinct increase of density. (5) Both  $\text{Al}_2\text{O}_3$  and kaolin lower the dissociation temp. of alk. earth carbonates at 1 atm. about  $220^\circ$ . (6) Upon heating a mixt. of  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  heat evolution takes place at  $940^\circ$  as on heating kaolin and in both cases the  $\text{Al}_2\text{O}_3$  becomes difficultly sol., but this same change of soly. is produced by heating  $\text{Al}_2\text{O}_3$  alone.

A. R. M.

**Antimony pentoxide hydrate.** G. JANDER AND A. SIMON. *Z. anorg. allgem. Chem.* 127, 68-82 (1923); cf. C. A. 13, 1191.—Expts. are detailed upon 3 preps. obtained by hydrolyzing pure  $\text{SbCl}_5$  (1) in  $\text{Cl}$ -water at  $0-1^\circ$ , (2) at  $100^\circ$ , (3) oxidation of re-dist.  $\text{SbCl}_3$  by concd.  $\text{HNO}_3$  and hydrolysis of the product at  $60^\circ$ . The preps. were washed till  $\text{Cl}$ -free and dried on porous plates in air. The water contents per mol.

$\text{Sb}_2\text{O}_3$  were: (1) 30.57 mols.; (2) 9.97 mols.; (3) 7.91 mols. After (a) equil. over  $\text{H}_2\text{SO}_4$  at room temp. and (b) drying at  $105^\circ$ , mols. water per mol.  $\text{Sb}_2\text{O}_3$  were resp.: (1) 3.68, 2.43; (2) 2.17, 1.02; (3) 0.60, 0.45. The actions of the 3 preps. toward alkali and toward  $\text{H}_3\text{PO}_4$  were studied and the vapor tension isotherms measured. All results indicated absence of definite hydrates and that gels were present, the chemical properties of which depend on grain-size as conditioned by mode of prepn. Results parallel closely those obtained by Mecklenburg (*C. A.* 6, 1720) for stannic acid. Alcohols of  $\text{Sb}_2\text{O}_3$  were prepd. by treating hydrogels with increasing concns. of EtOH. On maintaining these over glycerol dealcoholation curves were obtained entirely similar to those of dehydration of the hydrogel. Both dehydrated hydrogel and dealcoholated alcohol took up  $\text{C}_2\text{H}_6$  when maintained in an atm. of the latter.

A. R. MIDDLETON

**Silicon hydrides. XV.** Trisilane and chloroform. ALFRED STOCK AND PAUL STIEBELER. *Ber.* 56B, 1087-91(1923); cf. *C. A.* 17, 2244.—The violent explosion on bringing the silanes  $\text{Si}_3\text{H}_8$ ,  $\text{Si}_4\text{H}_{10}$  and  $\text{Si}_5\text{H}_{12}$  (not  $\text{SiH}_4$ ) into contact with  $\text{CCl}_4$  or  $\text{CHCl}_3$  was found to be due to small amts. of  $\text{O}_2$  dissolved in the latter. When these were freed from  $\text{O}_2$  in *vacuo* no reaction at all took place even on warming to  $75^\circ$ , provided air was completely excluded, but admission of a little air at once produced explosion. Catalytic action of water is not involved, since moist  $\text{CCl}_4$  or  $\text{CHCl}_3$  did not react in absence of air. The reaction is catalyzed by  $\text{AlCl}_3$  and proceeds at a velocity which is practicable for investigation—slow at room temp., fairly rapid at  $50-70^\circ$ . Study of the action of  $\text{Si}_3\text{H}_8$  on  $\text{CHCl}_3$  showed that the chief reactions are  $\text{Si}_3\text{H}_8 + 4\text{CHCl}_3 = \text{Si}_3\text{H}_7\text{Cl}_4 + 4\text{CH}_2\text{Cl}_2$  and  $\text{Si}_3\text{H}_8 + 5\text{CHCl}_3 = \text{Si}_3\text{H}_6\text{Cl}_4 + 5\text{CH}_2\text{Cl}_2$ . The more electro-positive character of Si as compared with C clearly appears.

A. R. M.

**New forms of perchlorates.** D. VORLÄNDER AND ERICH KAASCHT. *Ber.* 56B, 1157-62(1923).—Transformation of the ordinary rhombic form into a regular isotropic form occurs in perchlorates of alkali metals, except that of Li, and those of Tl and Ag. Transformation temps. found were: Na,  $308^\circ$ ; K,  $299-300^\circ$ ; Rb,  $279^\circ$ ; Cs,  $219^\circ$ ; NH<sub>4</sub>,  $240^\circ$ ; Tl,  $266^\circ$ ; Ag,  $155-9^\circ$ . The Tl salt is particularly well suited for microprojection demonstration, as the rhombic form is more strongly birefringent than the alkali metal salts. The Ag salt decomposes somewhat at the transition temp.; another transition from a less to more strongly birefringent form appears to take place ( $102-110^\circ$ ). The Ba salt has two cryst. forms with transition at  $284^\circ$ , but both are optically anisotropic. The other alk. earth perchlorates and that of Li show no dimorphism in anhydrous condition. A similar transition into a regular form was observed in  $\text{N}(\text{CH}_3)_4\text{ClO}_4$  at about  $350^\circ$ .  $\text{N}(\text{C}_2\text{H}_5)_4\text{ClO}_4$  melted with decompn. before transformation, as did  $\text{KMnO}_4$ .

A. R. M.

**Experiments with anhydrous perchloric acid.** D. VORLÄNDER AND ERICH KAASCHT. *Ber.* 56B, 1162-4(1923).—The dark red-brown soln. which results when  $\text{KClO}_4$  is covered with concd.  $\text{H}_2\text{SO}_4$  is probably an unstable compd. of  $\text{ClO}_2$  and  $\text{HClO}_4$ . A cryst. mush of this color was obtained by leading  $\text{ClO}_2$  admixed with  $\text{CO}_2$  (from 15 g. of  $\text{KClO}_3$ ,  $\text{H}_2\text{C}_2\text{O}_4$  and  $\text{H}_2\text{SO}_4$ ) into 1 cc. of anhyd.  $\text{HClO}_4$  at  $-14^\circ$ . It deflagrated on contact with ice-water and melted when warmed to  $0^\circ$  with exclusion of moisture, forming a red-brown soln. which evolved  $\text{ClO}_2$ . A deep brown soln. resulted when  $\text{KClO}_4$  was covered with anhyd.  $\text{HClO}_4$  at room temp. Satd. with  $\text{ClO}_2$  at  $-15^\circ$ , 70%  $\text{HClO}_4$  became bright red and part of the  $\text{ClO}_2$  sepd. as a red oil. Anhyd.  $\text{HClO}_4$  dissolved readily in  $\text{POCl}_3$  without evolution of much  $\text{HCl}$ . It reacted readily with  $\text{PCl}_5$  forming apparently  $\text{Cl}_2\text{O}$  and  $\text{POCl}_3$ . Some other qualitative reactions are mentioned.

A. R. M.

**Germanium. V.** Extraction from germanium-bearing zinc oxide. Direct preparation of germanium dioxide free from arsenic. Detection of minute amounts of arsenic in germanium dioxide. L. M. DENNIS AND E. B. JOHNSON. *J. Am. Chem. Soc.* 45, 1380-91(1923).—The new method is based on soln. of  $\text{ZnO}$  in concd.  $\text{HCl}$  and sepn. of  $\text{GeCl}_4$  by column distn. with a column still of new design (pictured). A current of  $\text{Cl}_2$  passed through the app. during distn. prevents volatilization of As. Use of  $\text{H}_2\text{S}$  is obviated. The  $\text{GeCl}_4$  is then concd. by successive redistn. Of the Ge in the crude material 99% is recovered, 83% directly as  $\text{GeO}_2$ , 16% indirectly by return of the material to later runs. Spectroscopic examn. indicated that the  $\text{GeO}_2$  produced by this method contained less than 0.001% Fe and less than 0.0005% As.

A. R. M.

**Systematic affinity principle. XX.** Amines of alkali metal halides. W. BILTZ AND W. HANSEN. *Z. anorg. allgem. Chem.* 127, 1-33(1923); cf. *C. A.* 17, 1393.—Methods and app. were those previously described. The following compds. (new ones italicized) were found. Heats of formation in cal. and temp. at which  $p_{\text{NH}_3} = 100$  mm. follow.  $\text{LiCl}$ , 5  $\text{NH}_3$ , 8.0,  $-44^\circ$ ; 4  $\text{NH}_3$ , 8.8,  $-20.5^\circ$ ; 3  $\text{NH}_3$ , 10.7,  $+23.5^\circ$ ; 2  $\text{NH}_3$ , 11.5,  $44^\circ$ ; 1  $\text{NH}_3$ , 12.4,  $70^\circ$ .  $\text{LiBr}$ , 6.5  $\text{NH}_3$ , 6.9,  $-67^\circ$ ; 5  $\text{NH}_3$ , 8.05,  $-44^\circ$ ; 4  $\text{NH}_3$ , 10.2,  $+20^\circ$ ; 3  $\text{NH}_3$ , 11.1,  $33^\circ$ ; 2  $\text{NH}_3$ , 11.7,  $48^\circ$ ; 1  $\text{NH}_3$ , 13.6,  $102^\circ$ .  $\text{LiI}$ , 7  $\text{NH}_3$ , 7.1,

—65°;  $5.5\text{NH}_3$ , 7.2, —62°;  $5\text{NH}_3$ , 8.1, —43°;  $4\text{NH}_3$ , 11.6, +60.5°;  $3\text{NH}_3$ , 12.2, 64°;  $2\text{NH}_3$ , 14.8, 108°;  $1\text{NH}_3$ , 16.0, 169°.  $\text{NaCl} \cdot 5\text{NH}_3$ , 7.8, —49°.  $\text{NaBr} \cdot 5.75\text{NH}_3$ , 6.95, —66°;  $5.25\text{NH}_3$ , 8.45, —31.5°.  $\text{NaI} \cdot 6\text{NH}_3$ , 7.5, —52°;  $4.5\text{NH}_3$ , 9.4, —3°.  $\text{KBr} \cdot 4\text{NH}_3$ , 7.15, —64°.  $\text{KI} \cdot 6\text{NH}_3$ , 7.35, —55°;  $4\text{NH}_3$ , 7.65, —46°.  $\text{RbBr} \cdot 3\text{NH}_3$ , 7.1, —62°.  $\text{RbI} \cdot 6\text{NH}_3$ , 7.5, —55°. Cs halides form no ammines nor do the chlorides of K and Rb. Careful search failed to detect any evidence for  $\text{NaCl} \cdot 2.5\text{NH}_3$  reported by Friedrichs (C. A. 15, 2230).

A. R. M.

**Density measurements on some simple and complex nickel and cobalt salts.** W. BLITZ AND R. BIRK. *Z. anorg. allgem. Chem.* 127, 34–42(1923).—The lattice structure of  $\text{Ni}(\text{NH}_3)_6\text{Cl}_2$  having been detd. by Scherrer (C. A. 16, 3239) and Wyckoff (C. A. 16, 2431), the lattice const. of the isomorphous hexammines of the Ni group can be calcd. from their densities, like structures being assumed. Accordingly these were detd. or redetd. Prepn. of the salts is described. As pycnometer liquid high-boiling fractions of petroleum,  $d_{25} = 0.7975$  and  $0.7998$ , were used. The following values were obtained:  $\text{NiCl}_2$  sublimed, 3.521;  $\text{NiCl}_2$  (by deamination of the hexamine in tensimeter), 3.508;  $\text{NiBr}_2$  sublimed, 5.098;  $\text{NiBr}_2$  deaminated, 5.042;  $\text{NiI}_2$  deaminated, 5.834;  $\text{CoCl}_2$ , 3.367;  $\text{CoBr}_2$ , 4.849;  $\text{CoI}_2$ , 5.584;  $\text{Ni}(\text{NH}_3)_6\text{Cl}_2$ , 1.468;  $\text{Ni}(\text{NH}_3)_6\text{Br}_2$ , 1.889;  $\text{Ni}(\text{NH}_3)_6\text{I}_2$ , 2.113;  $\text{Co}(\text{NH}_3)_6\text{Cl}_2$ , 1.479;  $\text{Co}(\text{NH}_3)_6\text{Br}_2$  (prepd. wet way), 1.871; same (prepd. dry way), 1.879;  $\text{Co}(\text{NH}_3)_6\text{I}_2$ , 2.096. These values in some cases differ considerably from those of previous measurements but are believed more accurate. Densities of the following cobaltic amines were also measured:  $\text{Co}(\text{NH}_3)_5\text{Cl}$ , 1.710; bromide, 2.340; iodide, 2.746.

A. R. M.

**Thorium molybdate.** F. ZAMBONINI. *Compt. rend.* 176, 1473–5(1923).—The salt was prepd. by fusing partially dehydrated  $\text{ThCl}_4$  with anhydrous  $\text{Na}_2\text{MoO}_4$  in excess. The product after leaching consisted of a white powder composed of minute bipyramidal crystals of the tetragonal system. Crystallographic data are given and compared with corresponding data for molybdates of alk. earths and of rare earths. Mol. vols., Ca, 47.1; Pb, 53.9;  $1/2\text{Th}$ , 56.1; Y, 137.4; Nd, 149.5; Ce, 151.2; Pr, 157.3; La, 158.9;  $1/2\text{Ta}$ , 168.3. The differences are of the order observed in typical isomorphous series. From the crystallographic relations with the molybdates cited it was concluded that  $\text{Th}(\text{MoO}_4)_2$  should form mixed crystals with molybdates of Ca, etc., and with those of rare earths. Fusion of a mixt. of chlorides of Th and Ce with anhyd.  $\text{Na}_2\text{MoO}_4$  gave two types of crystals: (1) type of  $\text{Th}(\text{MoO}_4)_2$ , clear pale yellow, contg. about 1% of  $\text{Ce}(\text{MoO}_4)_2$ ; (2) type of cerous molybdate contg. 6% of  $\text{Th}(\text{MoO}_4)_2$ . This small mutual soly. in the solid state of the molybdates of Th and  $\text{Ce}^{III}$  lends support to Urbain's contention against Coster and Hevesy that *celtium* (hafnium), although a homolog of Zr, can occur with rare earths.

A. R. M.

**Phosphotungstates with three  $\text{WO}_3$ .** F. KHRMANN AND R. MELLET. *Helvetica Chim. Acta* 6, 443–9(1923); cf. C. A. 17, 1197.—Details are given of the purification and analysis of the Na, K and  $\text{NH}_4$  salts of this series. All three salts reached const. wt. in a desiccator with retention of 3 mols. of water, which are given up only at high temp. The Na salt is very sol. in water, forms supersatd. solns., and crystallizes slowly, even after inoculation, in rosettes of striated prisms. The K and  $\text{NH}_4$  salts are much less sol., crystallize readily on cooling from 50° and 40°, resp., the K salt in brilliant, prismatic needles, the  $\text{NH}_4$  salt in short prisms. All have a pronounced sugary taste and are distinguished from other series of phosphotungstates by giving voluminous translucent ppts. with  $\text{AgNO}_3$  and with  $\text{BaCl}_2$ . The aq. solns. are distinctly alk.; that of the  $\text{NH}_4$  salt loses  $\text{NH}_3$  above 40°. Analysis indicates the formula  $3\text{M}_2\text{O} \cdot \text{P}_2\text{O}_5 \cdot 6\text{WO}_3 \cdot 3\text{H}_2\text{O} + (\text{Na})$ , 13 aq. (K), 11 aq. ( $\text{NH}_4$ ), 6 aq. All attempts to prep. the free acid failed although the analogous  $\text{H}_3[\text{AsO}(\text{MoO}_4)_3]$  is remarkably stable.

A. R. M.

**Oxidizing properties of sulfur dioxide. IV. Molybdenum sulfates.** WM. WARD-LAW AND N. D. SYLVESTER. *J. Chem. Soc.* 123, 969–80(1923); cf. C. A. 16, 1367.—Solns. of  $\text{Mo}^{III}$  were prepd. by electrolytic reduction in an atm. of  $\text{N}_2$ . The color of the completely reduced soln. was salmon-pink in the presence of highly concd. acid, green in less concd. acid.  $\text{SO}_2$  reduced these solns. to stages intermediate between  $\text{Mo}^{III}$  and  $\text{Mo}^V$  with pptn. of S and a Mo sulfide not  $\text{MoS}_3$ . The degree of oxidation increases with increasing concn. of acid, the max. stage being approx.  $\text{Mo}_2\text{O}_4$ . The solns. become bright carmine-red. Solns. of  $\text{Mo}^{III}$  in 0.5 N  $\text{H}_2\text{SO}_4$  react differently with  $\text{SO}_2$ ,  $\text{H}_2\text{SO}_4$  probably being formed, and nearly all the Mo pptd. probably as a mixt. of  $\text{Mo}_2\text{O}_3$ ,  $\text{H}_2\text{O}$  and  $\text{Mo}(\text{OH})_3$ .  $\text{SO}_2$  does not reduce  $\text{H}_2\text{SO}_4$  solns. of Mo corresponding to stages between  $\text{Mo}_2\text{O}_4$  and  $\text{Mo}_2\text{O}_5$ , but from stages slightly greater than  $\text{Mo}_2\text{O}_4$  molybdenum-blue is formed not as a specific effect of  $\text{SO}_2$  but from equil. between  $\text{Mo}_2\text{O}_4$  and  $\text{MoO}_3$ . Sufficiently concd.  $\text{H}_2\text{SO}_4$  inhibits reduction of  $\text{Mo}^{VI}$  by  $\text{SO}_2$ .

A. R. M.

**Thallium compounds. II. Reduction of thallic compounds with ferrous sulfate and with sodium arsenite.** A. J. BERRY. *J. Chem. Soc.* 123, 1109-11 (1923); cf. *C. A.* 16, 2091.—The velocity of the reaction  $\text{Tl}_2(\text{SO}_4)_3 + 4\text{FeSO}_4 = \text{Tl}_2\text{SO}_4 + 2\text{Fe}_2(\text{SO}_4)_3$  was measured at 0°. Data indicate that the reaction is of the second order. The  $\text{Na}_3\text{AsO}_3$  method previously described was modified to obviate removal of reduced Tl as iodide before detg. the excess of arsenite. A soln. of  $\text{NaClO}$  could be standardized by titrating against a hot soln. of  $\text{NaH}_2\text{AsO}_3$  contg. a little  $\text{Tl}_2\text{SO}_4$ , the brown color due to incipient pptn. of  $\text{Tl}_2\text{O}_3$  when all the As is oxidized being taken as end point.  $\text{Tl}_2\text{O}_3$  was prepd. by various methods and its available O found to be always low by 2-6%, depending on the method of prepn. This was due to adsorption of thallos salt. The black oxide is entirely stable at 500° while at this temp. the brown oxide prepd. by hydrolysis of the sulfate loses considerable O. A. R. M.

**Sulfides of ammonium.** J. S. THOMAS AND R. W. RIDING. *J. Chem. Soc.* 123, 1181-9 (1923).—Solns. obtained by the action of  $\text{H}_2\text{S}$  on  $\text{EtOH}$  solns. of  $\text{NH}_3$  contain both  $\text{NH}_4\text{HS}$  and  $(\text{NH}_4)_2\text{S}$  in equil. with each other and yield crystals of varying compn. Low temp. favors formation of  $\text{NH}_4\text{HS}$  and this was obtained nearly pure by crystg. a soln. prepd. at 0° and rapidly washing the crystals with small amts. of  $\text{EtOH}$ . Crystals of  $(\text{NH}_4)_2\text{S} \cdot \text{EtOH}$  were obtained by fractionally ptg. with  $\text{Et}_2\text{O}$ , satd. with  $\text{NH}_3$ , solns. the temp. of which had been allowed to rise. Anhydrous  $\text{NH}_4\text{HS}$  is best prepd. by passing alternately  $\text{NH}_3$  and  $\text{H}_2\text{S}$  into dry  $\text{Et}_2\text{O}$ . Attempts to convert  $\text{NH}_4\text{HS}$  into  $(\text{NH}_4)_2\text{S}$  by prolonged action of satd. solns. of  $\text{NH}_3$  in  $\text{Et}_2\text{O}$  failed, but in presence of a little  $\text{EtOH}$  a yellow oil sepd. of compn.  $(\text{NH}_4)_2\text{S} \cdot 2\text{NH}_3$ , together with a few cubic crystals believed to be anhyd.  $(\text{NH}_4)_2\text{S}$ . Similar crystals were obtained when the oil was kept in an open vessel. Ratio  $\text{NH}_3/\text{H}_2\text{S} = 1.92-2.11$ . A. R. MIDDLETON.

**The alkalinity of ammonia.** A. E. C. SMITH. *Chemistry & Industry* 42, 578 (1923).—Cavco (*C. A.* 17, 2402) quotes Holleman to the effect that  $\text{NH}_4\text{OH}$  must be a strong base since  $\text{NH}_4\text{Cl}$  is little hydrolyzed in soln., the feeble basicity of  $\text{NH}_3$  solns. being due to the tendency of  $\text{NH}_4\text{OH}$  to split up into  $\text{NH}_3$  and  $\text{H}_2\text{O}$ . While it is theoretically possible to prove  $\text{NH}_4\text{OH}$  a strong base on the assumption that its aq. solns. are largely split into  $\text{NH}_3$  and  $\text{H}_2\text{O}$  instead of  $\text{NH}_4^+$  and  $\text{OH}^-$ , measurements of the acidity of  $\text{NH}_4\text{Cl}$  solns. by Denham (*C. A.* 2, 1089) do not support this view. T. S. CARSWELL.

**Oxidation of nickel sulfide.** J. S. DUNN AND E. K. RIDEAL. *J. Chem. Soc.* 123, 1242-51 (1923).—The  $\alpha$ -sulfide, prepd. by freshly made  $(\text{NH}_4)_2\text{S}$  and Ni salt, retains water strongly and is comparatively active chemically; the  $\beta$ -sulfide, by passing  $\text{H}_2\text{S}$  into  $\text{Ni}(\text{AcO})_2$  soln., is black, denser than the preceding sulfide and more easily dried; the  $\gamma$ -sulfide prepd. by passing  $\text{H}_2\text{S}$  into solns. of  $\text{Ni}(\text{AcO})_2$  acidified with  $\text{AcOH}$ , and boiling with 2 N  $\text{HCl}$ , which partially converts the  $\beta$ - to  $\gamma$ -sulfide and dissolves the rest, is a gray powder with pyritic luster and is much less active than the other forms. The preps. were thoroughly washed and dried *in vacuo* over  $\text{CaCl}_2$ . A definite amt. of a NiS in a definite vol. of water was shaken with  $\text{O}_2$  and the rate of disappearance of the gas noted. Most expts. employed the  $\beta$ - and  $\gamma$ -forms. For these the data indicate that the oxidation is a surface reaction with temp. coeff. of approx. 2-per 10°. An intermediary formation of basic salts is shown, supporting the hypothesis of a two-stage reaction. The oxidation is markedly accelerated by sol. V salts, which are adsorbed and give  $\text{NiSO}_4$  without intermediary formation of basic salts. The catalytic effect is ascribed to colloidal  $\text{V}(\text{OH})_3$  and is greatest in weakly acid solns. A. R. M.

**Action of thiosulfates on cupric salts.** H. BASSETT AND R. G. DURRANT. *J. Chem. Soc.* 123, 1279-91 (1923).—From a quant. study of the reactions the following conclusions are drawn. Excess of  $\text{Na}_2\text{S}_2\text{O}_3$  at once reduces cupric salts to cuprous according to  $2\text{CuA}_2 + 3\text{Na}_2\text{S}_2\text{O}_3 = \text{Cu}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{S}_2\text{O}_4 + 4\text{NaA}$ . From N, or more concd., solns. the yellow salt,  $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_4 \cdot 6\text{H}_2\text{O}$ , crystallizes rapidly. This salt can be obtained pure from solns. of  $\text{Cu}(\text{NO}_3)_2$ ; from  $\text{CuSO}_4$  it contains isomorphous  $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_4 \cdot 6\text{H}_2\text{O}$  in solid soln.; in solns. of  $\text{CuCl}_2$  the yellow salt soon changes to white  $\text{Cu}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_4 \cdot \text{H}_2\text{O}$ , which invariably contains  $\text{Cu}_2\text{Cl}_2 \cdot 2\text{NaCl} \cdot \text{H}_2\text{O}$  in solid soln. In this case the yellow salt was found to be a mixt. contg. some of the white salt. The pure yellow salt (from nitrate solns.) is stable if kept dry and prepd. perfectly free from adhering  $\text{Na}_2\text{S}_2\text{O}_4$ . Its soly. is about 3 pts. per 1000 in water at 10°. On strong heating in absence of air it decomposes according to  $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_4 \cdot 6\text{H}_2\text{O} = 3\text{Cu}_2\text{S} + 2\text{Na}_2\text{SO}_4 + \text{H}_2\text{SO}_4 + 2\text{SO}_2 + 2\text{S} + 5\text{H}_2\text{O}$ . A white salt,  $2\text{Cu}_2\text{S}_2\text{O}_3 \cdot 3(\text{NH}_4)_2\text{S}_2\text{O}_4 \cdot \text{H}_2\text{O}$ , was obtained from concd. solns. of  $\text{Cu}(\text{NO}_3)_2$  and  $(\text{NH}_4)_2\text{S}_2\text{O}_3$ .  $\text{Cu}_2\text{S}$  is pptd. by excess of thiosulfates from hot solns. of cupric salts contg. mineral acid but pptn. is not complete, even after prolonged boiling if  $\text{HCl}$  is used, apparently because the double chloride (above) cannot decompose into  $\text{Cu}_2\text{S}$ . Pptn. is complete if  $\text{HNO}_3$  less than 0.5 N is

used and with  $\text{H}_2\text{SO}_4$  which should be fairly concd. if any  $\text{CuCl}_2$  is present. Under these conditions  $\text{H}_2\text{S}_2\text{O}_8$  is formed by  $\text{Na}_2\text{S}_2\text{O}_8 + \text{Na}_2\text{S}_2\text{O}_3 + 4\text{HA} = \text{H}_2\text{S}_2\text{O}_8 + 4\text{NaA} + \text{SO}_2 + \text{H}_2\text{O}$ . Both the positive and the negative tests given by Dehus (*J. Chem. Soc.* 53, 297(1888)) for distinguishing  $\text{H}_2\text{S}_2\text{O}_8$  from colloidal S were confirmed; in addition it was found that a mere trace of  $\text{DiCl}_3$  pptd. S from colloidal soln. while a considerable amt. has no effect on  $\text{H}_2\text{S}_2\text{O}_8$ , which is unaffected by electrolytes unless made alk. Another way to differentiate them is to boil each a short time with  $\text{HCl}$  and then apply Dehus's positive tests involving alkali.  $\text{H}_2\text{S}_2\text{O}_8$  responds to all the tests; the S, previously colloidal, to none of them. As a contribution to the moot point of the theory of formation of  $\text{H}_2\text{S}_2\text{O}_8$  and its stability, evidence is offered that the acid is fairly stable but that the anions of its salts,  $\text{HS}_2\text{O}_8^-$  or  $\text{S}_2\text{O}_8^{2-}$ , are highly unstable: (1) perfectly clear filtrates in Wackenroder preps. became turbid on addn. of pure water; (2) any reagent which develops alkalinity immediately pptd. S (salt formation); (3) solns. of  $\text{H}_2\text{S}_2\text{O}_8$  in a slight excess of mineral acid slowly decompose in the cold into  $\text{H}_2\text{SO}_4$ , S and  $\text{SO}_2$ , but in fairly concd. mineral acid the soln. may be boiled several hrs. without deposition of S.

A. R. MIDDLETON

**Formation of hydrogen peroxide in the combustion of hydrogen.** MAX HAUSER. *Ber.* 56B, 888-94(1923).—Attempts to show that  $\text{H}_2\text{O}_2$  is an intermediate product in the combustion of H were carried out in 3 ways: (1) by using a catalyst which might accelerate the reaction  $\text{H}_2 + \text{O}_2 = \text{H}_2\text{O}_2$  at a temp. at which the reaction  $\text{H}_2\text{O}_2 = \text{H}_2\text{O} + \frac{1}{2}\text{O}_2$  is still small; (2) and (3) by working at a temp. range at which the 2 gases combine spontaneously but cooling immediately (adiabatic compression and the v. Wartenberg hot-cold tube (*C. A.* 15, 814)). For the expts. were used 2 non-explosive mixts. of  $\text{H}_2 + \text{O}_2$  contg. a 10-fold excess of one or the other gas. (1) The reaction chamber was a vertical quartz tube (heated electrically between  $100^\circ$  and  $500^\circ$ ) passing at its lower end into a wider  $\text{H}_2\text{O}$ -cooled Cu or glass tube. As reagent  $\text{TiO}_2$  was used, capable of detecting 0.00001%  $\text{H}_2\text{O}_2$  with ease. Preliminary expts. having shown that under the conditions of the expt. Cu and Fe gauze, glass fragments and wool, and porous clay ware do not appreciably decomp.  $\text{H}_2\text{O}_2$ , while asbestos, Pt- and Pd-asbestos, pumice and Al filings completely decomp. it, the catalysts (Pt, Pd, Ag, Cu, Fe, Co and Ni) were prepd. by impregnating clay fragments in the usual way with the nitrates or chlorides, igniting and reducing. Although  $\text{H}_2\text{O}$  was formed, as shown by analysis of the entering and the escaping gases,  $\text{H}_2\text{O}_2$  could in no case be detected. (2) The mixt. of  $\text{H}_2 + \text{O}_2$  (about 0.27 l.) was enclosed in a steel cylinder contg. 10 cc.  $\text{H}_2\text{O}$  and a 30 kg. wt. dropped upon the piston which was instantly raised again by the pressure developed; the walls of the cylinder remained cold during the short interval. Again,  $\text{H}_2\text{O}_2$  could in no case be detected. (3) In the v. Wartenberg quartz hot-cold tube contg. in the heated zone (about  $780^\circ$ ) either nothing or quartz capillaries, Cu gauze or Pt or Ag foil,  $\text{H}_2\text{O}_2$  was obtained in amts. of the same magnitude as those obtained by him; these amts. do not run parallel with those of  $\text{H}_2$  burned nor is there any simple connection between the amts. of  $\text{H}_2\text{O}_2$  formed and the various substances placed in the tube. The difference in the results in (3) as compared with those in (1) and (2) is attributed to the catalytic action of the glowing wall in (3). As a whole, a large part of the H is burnt according to the equation  $2\text{H}_2 + \text{O}_2 = 2\text{H}_2\text{O}$ ; of the  $\text{H}_2\text{O}_2$  which is also formed in (3) a part can, under suitable conditions, be saved by rapid cooling, another part (depending on the excess of  $\text{H}_2$  present in the mixt. of gases) is reduced, and a 3rd part possibly decomp. into  $\text{H}_2\text{O}$  and  $\text{O}_2$ .

C. A. R.

**The preparation of pure tungsten dioxide and tungsten pentoxide.** J. A. M. VAN LIEMPT. *Z. anorg. allgem. Chem.* 126, 183-4(1923).—The equil. curves of these oxides with  $\text{H}_2$  or  $\text{H}_2\text{O}$  show that at  $900^\circ$   $\text{WO}_2$  should be stable in a gas mixt. contg. 40-55%  $\text{H}_2$  and 60-45%  $\text{H}_2\text{O}$ ; and  $\text{W}_2\text{O}_5$  in 12%  $\text{H}_2$  plus 88%  $\text{H}_2\text{O}$ . To prep.  $\text{WO}_2$  and  $\text{W}_2\text{O}_5$  heat a thin layer of  $\text{WO}_3$  to  $900^\circ$ , and lead over it for 2 hrs. a stream of  $\text{H}_2$  which has been passed through a well insulated flask contg.  $\text{H}_2\text{O}$  kept at  $85^\circ$  and  $97^\circ$ , resp.

R. H. LOMBARD

**Contribution to the chemistry of the platinum metals. III. Preparation of ruthenium pentoxide.** HEINRICH REMY. *Z. anorg. allgem. Chem.* 126, 185-92(1923); cf. *C. A.* 17, 499.— $\text{Ru}_2\text{O}_5$  is formed when  $\text{Ru}(\text{OH})_3$  is oxidized by  $\text{O}_2$  of the air, and it is also a decomp. product of  $\text{RuO}_4$  when the latter is preserved for a long time in a sealed glass tube. In both cases, the product contains  $\text{H}_2\text{O}$ , and if formed from an alk. soln. it contains alkali. Whether  $\text{Ru}_2\text{O}_5$  is combined with the  $\text{H}_2\text{O}$  and alkali in simple stoichiometrical proportions is not yet detd. Ru is the only element which exhibits all valences from 1 to 8. The difficulties which attended unsuccessful attempts to prepare pure  $\text{Ru}(\text{OH})_3$  are described.

R. H. LOMBARD

**A hydrate of iodine.** P. VILLARD. *Compt. rend.* 176, 1516-8(1923).—Many sub-

stances capable of forming hydrates have a vapor pressure lower than the dissociation pressure of the hydrate at ordinary temps. and pressures. By placing the system in a gaseous atmosphere, such as oxygen or nitrogen, under pressure this difficulty can be overcome. The effect is partly due to bringing closer together the vapor pressure of the substance from which the hydrate is desired, and the dissociation pressure of the hydrate; and partly to a solution of the substance in the compressed gas. In nitrogen under 200 atm., iodine forms a beautiful violet crystalline hydrate. It is suggested that such a method might be capable of producing some very interesting hydrates, since paraffin is soluble in compressed ethylene gas above its critical point. Even mercury might be hydrated.

A. E. STERN

**Fluosilicic acid.** The maximum concentration of the acid at room temperatures. C. A. JACOBSON. *J. Phys. Chem.* 27, 577-80(1923).—The acid was prepd. by passing  $\text{SiF}_4$  into  $\text{H}_2\text{O}$ . The products of the reaction are  $\text{H}_2\text{SiF}_6$  and silicic acid. No HF is liberated. The soln. was concd. to 60.92%  $\text{H}_2\text{SiF}_6$  by distn. under reduced pressure at room temp. The most concd. soln. previously obtained is stated to have been about 30%.

H. B. MERRILL

A new phototropic compound of mercury (VENKATARAMAIAH, RAO) 2.

### 7—ANALYTICAL CHEMISTRY

WILLIAM T. HALL

**Hexamethylenetetramine as a reagent in qualitative analysis.** H. I. COLB. *Philippine J. Sci.* 22, 631-7.— $(\text{CH}_2)_6\text{N}_4$  (A) gives distinctive microscopic tests which serve for the identification of salts of Sb, Bi, Sn, Cd, Au, Ir, Pt, Pd, Hg and Ag. It can also be used as a group reagent for Ca, Mg, Fe and Mn. Add a fragment of the solid to a drop of the soln. to be tested and exam. under a low-power microscope. With Sb in HCl soln. colorless octahedra and dodecahedra first appear. One part Sb in 1500 of soln. can be detected. Further addn. of KI causes the formation of yellow octahedra and the test with both reagents is 10 times as sensitive as when KI is not used. Similar tests are obtained with Bi but with this element the crystals never polarize, whereas with Sb some crystals toward the periphery of the drop are square-sided prisms exhibiting parallel extinction. With Cd in concd. HCl, thin colorless plates belonging to the hexagonal system are formed with A. Further addn. of KI causes the formation of square-ended plates of the hexagonal system. The reactions with Ca, ferrous Fe, Mg and Mn are very similar; triclinic, 4- or 6-sided plates in HCl soln. with A alone and a similar crystal and more sensitive reaction with A + KI. Au solns. give very characteristic yellow needles or thin plates showing strong polarization with parallel extinction. Hg and Ag interfere with the Au test and Pd tends to make the Au come out as moss-like crystals. Ir salts give very characteristic reddish brown octahedra or crosses. Pt gives a test similar to that with Au. Pd salts yield thin colorless plates strongly polarized under crossed nicols. Mercuric salts in neutral soln. give colorless, square-ended prisms of the monoclinic system. Ag salts in  $\text{HNO}_3$  soln. form colorless needles or plates of the monoclinic system.

W. T. HALL

**Volumetric analyzer.** P. FABRON. *Ann. chim. anal. chim. appl.* 5, 161-2 (1923).—It is recommended to carry out pptn. in a vessel shaped like a test-tube with a narrow, graduated tube at the bottom. If one analysis is made in the usual way and a duplicate is made in one of these graduated tubes then by reading the height of ppt. it is known what wt. of constituent corresponds to this calibration. The principle is the same as that so often used in centrifuge tubes.

W. T. HALL

**Methods and apparatus for the determination of dust suspended in air.** P. H. WARREN and T. A. READ. *Proc. Australasian Inst. Mining Met.* N. S., No. 47, 297-342 (1922).—A very comprehensive paper contg. much valuable information concerning the problem of detg. dust in mine air with particular reference to the use of the Kotze konimeter, sugar tubes, the Read water spray and Kotze ejector. The original paper must be consulted for details.

W. T. HALL

**Tests for hydrocyanic acid gas in the air.** S. H. KATZ and E. S. LONGFELLOW. *J. Ind. Hyg.* 5, 97-104(1923).—It is often desired to know how much HCN remains in a tank, fumigated vessel or building after it has been aired. The Bureau of Mines has developed a very simple outfit, with the aid of which a man provided with a gas mask contg. soda-lime as absorbent can enter a fumigated area and detn. with reasonable accuracy how much HCN remains. Tests are made with papers contg. (1) Na picrate, (2) guaiacum and Cu soln., and (3) phenolphthalein and Cu soln. With the first reagent

the color is yellow in the absence of HCN but varies from yellow-orange, tan to brown as the HCN content increases. With the second reagent a blue color develops and with the third a pink or bluish pink shade. The results obtained by these field tests agree within 20% of the values obtained by chem. analysis.

**The analysis of calcium phosphate.** R. NAKASEKO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 6, 157-64 (1923).—Dissolve 0.5 g. of sample in 10 cc. of water and 2 cc. of 6 N HNO<sub>3</sub>. Add 10 cc. of 6 N AcOH, dil. to 200 cc. and ppt. the Ca with 30 cc. of 0.4 N KHC<sub>2</sub>O<sub>4</sub> by adding 5 cc. of satd. AcONH<sub>4</sub> soln., boiling 10 min. longer and then neutralizing with NH<sub>4</sub>OH. Weigh as CaO or titrate with KMnO<sub>4</sub>. To the filtrate add 1 cc. of 5 cc. of 6 N H<sub>2</sub>SO<sub>4</sub>. Dil. to 200 cc., add 5 g. of NH<sub>4</sub>Cl and at the boiling temp. slowly add NH<sub>4</sub>OH till faintly ammoniacal. Heat 10 mins. longer, allow to stand 1 hr. in a warm place; filter and weigh the ppt. as Mn<sub>2</sub>P<sub>2</sub>O<sub>7</sub> to det. P.

**Titration of sulfates.** E. BENESCH. *Chem.-Ztg.* 47, 366 (1923).—Treat the neutral soln. with a slight excess of Ba(OH)<sub>2</sub> at the boiling temp. Ppt. the excess Ba with (NH<sub>4</sub>)<sub>2</sub>CO<sub>3</sub>, filter and titrate the filtrate with standard acid, using methyl orange as indicator.

**The use of sodium chloride as a standard in the determination of halogens in sea water.** J. GIRAL AND F. A. GILA. *Compt. rend.* 176, 1729-30 (1923).—A series of gravimetric analyses shows that the presence of Na<sub>2</sub>SO<sub>4</sub>, MgSO<sub>4</sub> and CaSO<sub>4</sub> in sea water does not sensibly affect the detn. of halogens as Ag halide.

**The titration of solutions of permanganate and sodium arsenite.** W. T. HALL AND C. E. CARLSON. *J. Am. Chem. Soc.* 45, 1615-20 (1923).—It is possible to carry out the reaction between arsenite and permanganate in such a way that the former is oxidized to arsenate and the latter reduced to Mn<sup>++</sup> salt. Electrometric titrations show that when the titration is made under the conditions that prevail in steel analysis, the av. valence of the reduced Mn is 3.3, but if the reverse titration is made the MnO<sub>4</sub><sup>-</sup> is reduced to an av. valence of 2.5. Whenever, therefore, the reaction is used in practice it is important to work with special attention to temp., acidity and method of titrating.

**The use of chromate in volumetric analysis. III. The determination of chromate in the presence of ferric iron.** G. F. SMITH. *J. Am. Chem. Soc.* 45, 1666-75 (1923); cf. C. A. 17, 2091, 2247.—By the addn of H<sub>3</sub>PO<sub>4</sub> to a ferric soln. a complex ion is formed which does not react readily with iodide. Considerable Fe, however, causes trouble owing to the incompleteness of the complex formation. This difficulty can be overcome by adding Na<sub>2</sub>P<sub>2</sub>O<sub>7</sub> soln., which serves to keep the soln. so nearly neutral that only strong oxidizers will react with iodide. Under proper conditions it was found possible to det. chromate iodometrically without interference by Fe. A second method for detg. chromate consists in reducing the bromate by Na<sub>2</sub>C<sub>2</sub>O<sub>4</sub> in hot H<sub>2</sub>SO<sub>4</sub> soln. contg. Hg(ClO<sub>3</sub>)<sub>2</sub> and then titrating the excess oxalate with KMnO<sub>4</sub>. A third method is like the second with the substitution of FeSO<sub>4</sub> soln. for the oxalate and titrating cold.

**The detection of the elements of the hydrogen sulfide group with particular regard to spot reactions.** F. FEIGL AND F. NEUBER. *Z. anal. Chem.* 62, 369-84 (1923).—Diphenylcarbazide gives a bluish violet compd. with solns. contg. Hg. Moisten some filter paper with an alc. soln. of the reagent and touch the paper with a drop of the soln. to be tested. If the drop contains 0.001 mg. of Hg a violet spot will be obtained, which becomes darker when held over NH<sub>3</sub>. Pb, Bi and a little Cu do not interfere. Considerable Cu or Cd interferes but it is easy to sep. Hg from these elements by pptg. with H<sub>2</sub>S and treating the ppt. with HNO<sub>3</sub>. The colored compd. produced with mercuric salts dissolves in benzene but the corresponding mercurous compd. is insol. If, therefore, a soln. of Hg salt is treated with a benzene soln. of diphenylcarbazide, the benzene will be colored if a mercuric salt is present and colored flakes will deposit at the junction of the 2 liquids if a mercurous salt is present. Benzidine is a sensitive reagent for PbO<sub>2</sub>. Moisten some filter paper with ammoniacal 3% H<sub>2</sub>O<sub>2</sub> and touch it with a drop of the soln. to be tested for Pb. Wait a few mins. for the excess peroxide to decompose and then add a drop of benzidine acetate soln. A blue color develops with 0.0015 mg. of Pb. The reaction is also shown by Bi. If this element is present it is better to test with tetramethyldiaminodiphenylmethane. If not more than 11 times as much Bi as Pb is present, the test is very satisfactory. A soln. of cinchonine nitrate contg. some KI is a sensitive test for Bi. Moisten filter paper with a 1% cinchonine soln. contg. a little HNO<sub>3</sub> and 2% of KI. Touch the paper with a drop of the soln. to be tested and if Bi is present an orange spot will be obtained. 0.00014 mg. of Bi is sufficient. The presence of iodide causes interference when Cu, Pb or Hg is present but the formation of zones shows the presence or absence of Bi. If the soln. contains Hg, Pb, Cd and Bi,



a white spot at the middle will be due to Hg, this will be surrounded by an orange circle showing Bi, this by a yellow circle of PbI, and finally by a brown ring due to I, resulting from the action of iodide upon the Cu cation. Cu may be detected by either benzidine or hy phosphomolybdic acid. Moisten filter paper with a drop of the soln. to be tested, a drop of hot, satd. KBr soln. and one of benzidine hydrochloride. A blue color is produced by 0.00275 mg. of Cu. To prepare phosphomolybdic acid, add  $\text{NH}_4$  phosphomolybdate to hot aqua regia and boil until it dissolves completely. Evap., dissolve in water and recrystallize twice. To a drop of the soln. on filter paper, add successively KCN soln. HCl and phosphomolybdic acid. A blue color will be obtained if 0.0013 mg. of Cu is present. The test is less delicate when  $\text{HNO}_3$ , Pb, Hg or Bi is present. Diphenylcarbazide gives a reddish violet coloration with Cd ions. Moisten filter paper with diphenylcarbazide soln., add a drop of the soln. to be tested and hold over  $\text{NH}_3$ . Cu does not interfere when in the cuprous condition. To the cold, satd. soln. of diphenylcarbazide in 90% alc., add KCNS and a little KI. With this reagent there is no interference by Cu. Sometimes a coloration is produced by Ph, which may be mistaken for Cd. The Cd coloration when the KI reagent is used encircles the PbI<sub>2</sub> spot. The test for Cu depends upon the fact that the reduction of Mo in molybdate gives a fairly stable blue compd. if arsenic, phosphoric or silicic acid is present in combination with molybdate. Add some cold, satd. soln. of  $(\text{NH}_4)_2\text{MoO}_4$  to the soln. to be tested and an excess of  $\text{SnCl}_2$  soln. On warming the blue color soon disappears in the absence of As. If the As content is low and a brown reduction product is produced, the blue compd. can be shaken out with amyl alc. Sb can be detected by the intense blue color produced with a soln. of phosphomolybdic acid. The Sb should be in the tervalent condition. To detect Sn, moisten filter paper with phosphomolybdic acid soln. and hold over  $\text{NH}_3$  for a short time. A drop of stannous soln. gives a blue color. The test may be made in the presence of Sb, which only reacts with sol. phosphomolybdic acid, and in the above test the insol.  $\text{NH}_4$  salt is first produced. W. T. HALL.

Errors in the determination of hydrogen sulfide. F. H. HEATH AND F. A. LEE. *J. Am. Chem. Soc.* 45, 1643-7(1923).—For detg. the  $\text{H}_2\text{S}$  content of natural waters an iodometric method is often used but so many substances interfere that the results can hardly be regarded as reliable. The colorimetric method of Mecklenburg and Rosenkränzer (*C. A.* 8, 1938), is preferable. W. T. HALL.

The mechanical sampling of ore. A. T. FRY. *Eng. Mining J. Press* 115, 1053 (1923).—Attention is called to the work of R. H. Richards and it is pointed out how the data obtained by R. can be used with almost any kind of ore. W. T. HALL.

Modified method of testing for silver in barren solutions. F. C. BOND. *Eng. Mining J. Press* 115, 1117(1923).—The brown ppt. of  $\text{Ag}_2\text{S}$  obtained by treating with an alk. soln. of  $\text{Na}_2\text{S}$  fails with solus. very low in Ag when considerable Zn is present. By adding a small quantity of Ag and varying quantities of Zn to a cyanide soln. the Ag content can be estd. down to about 0.05 oz. per ton. Enough Zn should be added to correspond to the content of the soln. to be tested and enough Ag to bring the total content of Ag up to 0.25 oz. per ton when the  $\text{Ag}_2\text{S}$  color appears. W. T. HALL.

Determination of fineness of silver by Volhard's method as practiced at the Port Pirie Works of the Broken Hill Associated Smelters Pty., Ltd. T. A. KEATS. *Proc. Australasian Inst. Mining Met., N. S.* No. 47, 271-4(1922).—The details for carrying out this excellent method are given with a description of convenient ways to handle the solns. and of a buret which is easy to read because its 0 point and the bottom are much narrower tubes than the bulb contg. the bulk of the  $\text{NH}_4\text{CNS}$  standard soln. The buret is filled through 2 stopcocks from stock bottles kept on a shelf. W. T. H.

Improvement in the colorimetric determination of manganese in steel. H. FOR-ESTER. *Bull. soc. chim.* 33, 659-60(1923).—The colorimetric detn. of Mn by the persulfate method has the advantage that it is not necessary to remove the excess persulfate. If the white light is passed through a filter of  $\text{NiSO}_4$  soln. before reaching the permanganate-colored soln. it is easier to detn. the depth of color than when white light is used directly in the colorimeter. Colorimetric detns. of Mn in steel agree within 0.5% of the total Mn content. W. T. H.

The analysis of refined lead, as practiced at the Port Pirie Works of the Broken Hill Associated Smelters Pty., Ltd. A. J. HEMINGWAY. *Proc. Australasian Inst. Mining Met., N. S.* No. 47, 245-54(1922); cf. *C. A.* 16, 221.—Detailed directions are given for the detn. of Cu, Bi, Cd, Sn, Sb, As, Fe, Zn, S, Ni, and Ag in metal which is about 99.99% Pb. Analysis in duplicate with samples weighing 600 g. each is recommended. The metal is dissolved in  $\text{HNO}_3$  and any residue examd. for Sb and Sn. The Pb is removed as  $\text{PbSO}_4$  after filtration of the ppt. that forms in the presence of  $\text{HNO}_3$  and evapn. of the filtrate to fumes. The  $\text{PbSO}_4$  ppt. is treated several times with

HCl and a little  $\text{KClO}_4$  and the soln. evapd. to fumes, cooled, treated with a little  $\text{H}_2\text{C}_2\text{H}_3\text{O}_4$ , dild. and filtered to remove impurities. The combined filtrates are treated with  $\text{H}_2\text{S}$ , etc., and analyzed in the conventional way. WILLIAM T. HALL.

**Determination of copper.** PRTER KLASON. *Svensk Kem. Tids.* 53, 107-8. THURE SUNDBERG. *Ibid.* 53, 121-2 (1923); cf. Klason, *C. A.* 14, 3609. —Polemic on the relative merits of Allihn's reduction and iodometric estn. of Cu in sugar analysis.

A. R. ROSE

**Volumetric determination of iron. New method of reduction.** P. F. THOMPSON. *Proc. Australasian Inst. Mining Met.*, N. S., No. 47, 343-6 (1922). —To the hot, dil.  $\text{H}_2\text{SO}_4$  soln. contg.  $\text{Fe}^{+++}$  slowly add ZnS emulsion until a decided milkiness is obtained. (To prep. this emulsion, take 100 g. of Zn vitriol, dissolve in 2 l. of water and introduce  $\text{H}_2\text{S}$  with occasional addns. of  $\text{NH}_4\text{OH}$ , until no further ppt. is obtained. Decant off the soln., wash the ppt. a few times with very dil.  $\text{H}_2\text{SO}_4$  and dil. the emulsion to 2 l.) After the addn. of the ZnS, boil until a drop of the soln. will give no test for Fe with KCNS soln. If a brown sulfide is formed, filter the soln. Add a little marble and some dil.  $\text{H}_2\text{SO}_4$  and boil till the S becomes granular, and there is no more  $\text{H}_2\text{S}$  in the vapor. Cool quickly and titrate with  $\text{KMnO}_4$ . When the  $\text{K}_2\text{Cr}_2\text{O}_7$  titration in HCl soln. is used, the discharge of the  $\text{FeCl}_3$  color shows the completeness of the reduction.

W. T. HALL

**Notes on the estimation of tungsten in ores.** J. R. POUND. *Proc. Australasian Inst. Mining Met.*, N. S., No. 47, 291-6 (1922); *Chem. News* 126, 380-2 (1923). —Three well known methods for detg. W in ores and in concentrates are described together with many interesting notes which show the results of considerable technical experience.

W. T. HALL

**The electrometric titration of zinc and cadmium.** F. MÜLLER. *Z. anorg. allgem. Chem.* 128, 125-30 (1923). —By using Pt as indicator electrode, Hedrich, W. D. Treadwell, v. Bichowsky and others have obtained excellent results in the electrometric titration of Zn with  $\text{K}_4\text{Fe}(\text{CN})_6$  to form  $\text{K}_2\text{Zn}_3[\text{Fe}(\text{CN})_6]_4$ . Kolthoff (*C. A.* 16, 3281) was unable to get good results by the method of Hedrich. The expts. here described, however, confirm those of Hedrich. Zn even in the presence of Cd can be titrated with ferrocyanide electrometrically and this is the easiest and best way to det. Zn. In agreement with Treadwell, it was found possible to titrate Cd with Na ferrocyanide to form  $\text{Cd}_4\text{Fe}(\text{CN})_6$  but accurate results were not obtained with Zn in the same way. In titrating Cd with  $\text{K}_4\text{Fe}(\text{CN})_6$  the ratio of Cd :  $\text{Fe}(\text{CN})_6$ , even in the presence of Rb and Cs, was found greater than 1 : 1. When Zn and Cd are both present it is advisable to titrate with  $\text{K}_4\text{Fe}(\text{CN})_6$  for the Zn and then use the empirical factor recommended by Hedrich (cf. Müller, *Die electrometrische Massanalyse*) for the computation of the Cd content in the next titration.

W. T. HALL

**The technical analysis of lead blast furnace slag, as practiced at the Port Pirie Works of the Broken Hill Associated Smelters Pty., Ltd.** J. E. P. MURRIE. *Proc. Australasian Inst. Mining Met.*, N. S., No. 47, 229-36 (1922). —Treat 1 g. of slag with 20 cc. of hot aqua regia, evap. to dehydrate silica, filter, ignite and weigh the *total insol. matter*. Fuse this residue with soda, digest with acid, evap. and dehydrate in the usual way to det.  $\text{SiO}_2$ . Dil. the filtrate from the original insol. matter together with that from the  $\text{SiO}_2$  detn. to 250 cc. in a calibrated flask. Of this soln. take 100 cc., add 1 g.  $\text{NH}_4\text{Cl}$ , 10 cc.  $\text{Br}_2$  aq. and enough  $\text{NH}_4\text{OH}$  to make alk. Boil and treat with Br and  $\text{NH}_4\text{OH}$  again. Filter and reserve the filtrate for CaO and MgO detns. Dissolve the ppt. in HCl and det. Fe by the  $\text{K}_2\text{Cr}_2\text{O}_7$  method of Penny, calcg. as  $\text{FeO}$ . In the filtrate from the  $\text{NH}_4\text{OH}$  pptn., det. CaO by  $\text{KMnO}_4$  titration of the oxalate ppt. Introduce  $\text{H}_2\text{S}$  into the filtrate from  $\text{CaC}_2\text{O}_4$ , filter, make acid, add microcosmic salt and ppt. Mg as  $\text{Mg}_2\text{NH}_4\text{PO}_4$  by adding  $\text{NH}_4\text{OH}$  to the hot soln. Filter and weigh as  $\text{Mg}_2\text{P}_2\text{O}_7$ . To det. Mn, take 50 cc. of the original soln. from which  $\text{SiO}_2$  has been removed, add 5 cc.  $\text{HNO}_3$ , boil and ppt. Fe with ZnO emulsion. Titrate with  $\text{KMnO}_4$  by the Volhard method. In another 100-cc. aliquot, det.  $\text{Al}_2\text{O}_3$  as  $\text{AlPO}_4$  by pptn. with microcosmic salt and  $\text{Na}_2\text{S}_2\text{O}_8$  in the conventional manner. To det. Zn, weigh 1 g. of slag into a casserole, ppt.  $\text{MnO}_2$  by  $\text{KClO}_4$  in concd.  $\text{HNO}_3$  soln., filter and titrate with  $\text{KMnO}_4$  in slightly ammoniacal soln. contg. 5 g. of  $\text{KHC}_4\text{H}_4\text{O}_6$  at  $70^\circ$  using glacial  $\text{AcOH}$  as an outside indicator. Or, as an alternate method, dissolve the slag in HCl, evap. to dryness, cool, add concd.  $\text{HNO}_3$  and  $\text{KClO}_4$ , evap. to dryness, cool and treat the dry mass with 50 cc. of water and 7 g.  $\text{NH}_4\text{Cl}$ . Stir a few min. and then add 15 cc.  $\text{NH}_4\text{OH}$  and 0.5 g.  $\text{Na}_2\text{O}_2$ . Dil., filter and wash with 1%  $\text{NH}_4\text{Cl}$  soln. Dissolve the ppt. in HCl and repeat the pptn. with  $\text{NH}_4\text{OH}$  and  $\text{Na}_2\text{O}_2$ . Make the combined filtrates barely acid with HCl, ppt. Cu with granulated Pb, filter and titrate Zn with  $\text{K}_4\text{Fe}(\text{CN})_6$ . In rare cases some of the insol. residue contains Zn as silicate. It is then necessary to begin the analy-

sis by treating the slag with acid and the insol. residue with HF and  $\text{H}_2\text{SO}_4$ . To det. Pb, treat 5 g. of slag with aqua regia and remove  $\text{SiO}_2$  and other insol. matter. Treat repeatedly with HCl and dil. to remove all  $\text{PbCl}_2$ . Make the filtrate nearly neutral with  $\text{NH}_4\text{OH}$  and ppt.  $\text{PbS}$ , etc., with  $\text{H}_2\text{S}$ . Filter, dissolve in  $\text{HNO}_3$ , ppt.  $\text{PbSO}_4$ , dissolve this ppt. in  $\text{NH}_4\text{OAc}$  and titrate with standard  $(\text{NH}_4)_2\text{MoO}_4$ . To det. S treat 1 g. of slag with  $\text{HNO}_3$  satd. with  $\text{KClO}_3$ . Evap. to dryness with addn. of some soda, take up in dil. HCl, filter and ppt.  $\text{BaSO}_4$  as usual. To det. Cl boil 5 g. of slag with 100 cc. of 5%  $\text{Na}_2\text{CO}_3$  soln., filter and ppt.  $\text{AgCl}$  in dil.  $\text{HNO}_3$  soln. Scorify the washed ppt. with Pb and cupel the Pb button for Ag. To det. Cu, As and Sb, treat 10 g. of slag with 50 cc.  $\text{HNO}_3$  till decompd. Add 40 cc.  $\text{H}_2\text{SO}_4$  and evap. to fumes. Cool, dil., add a little  $\text{H}_2\text{C}_2\text{H}_3\text{O}_6$ , boil and filter. Nearly neutralize with  $\text{NH}_4\text{OH}$  and ppt. with  $\text{H}_2\text{S}$ . Wash the sulfides from the filter into a beaker and dissolve adhering sulfide in  $\text{HNO}_3$ . Make the soln. alk. with NaOH and warm to dissolve sulfides of Sh and As. Dil. to 100 cc., add 5 cc.  $\text{Na}_2\text{S}$  soln. and allow to stand 15 mins. in a warm place. Filter and wash with hot, dil.  $\text{Na}_2\text{S}$ . Use the filtrate for As and Sb detns. Dissolve the remaining sulfide ppt. in  $\text{HNO}_3$ , make ammoniacal and titrate Cu with KCN soln. Make the As and Sb soln., acid and introduce  $\text{H}_2\text{S}$ . Filter and wash with  $\text{H}_2\text{S}$  water. Dissolve the ppt. in NaOH soln., add 1 g.  $\text{KClO}_3$  powder and make acid with HCl. Filter, add tartaric acid and ppt. As as  $\text{MgNH}_4\text{AsO}_4$  in the usual way. Weigh as  $\text{Mg}_3\text{As}_2\text{O}_7$ . In the filtrate from this ppt., ppt. Sh as sulfide after boiling off excess  $\text{NH}_3$  and making acid with HCl. Weigh as  $\text{Sb}_2\text{S}_3$  after heating at  $300^\circ$  in  $\text{CO}_2$ . To assay for Ag, use 1 A. T. slag, 25 g. of soda, 20 g. of borax and 20 g.  $\text{PhO}$ . Sufficient S is usually present to form a button; if not add flour. To assay for Au, use 20 A. T. slag, 300 g. soda, 300 g. borax, 50 g. litharge, 3 g. flour and one 4-in. nail. W. T. HALL

A quick and simple way of testing for carbon monoxide in the blood or in the atmosphere. N. C. McLoud. *Coal Age* 23, 1067-9 (1923).—A convenient lab. or field kit is described which permits the detn. of 0.1% or more of CO in the atm. A sample of normal human blood is dild. with water and shaken with the gas to be tested. When normal blood is treated after dildn. with a soln. of tannin and pyrogallol a light brownish gray deposit appears. If CO is present in the blood a light carmine deposit is obtained and the intensity of the coloration is proportional to the CO. W. T. HALL

The pyrotannic acid method for the quantitative determination of carbon monoxide in blood and air. R. R. SAYERS, W. P. YANT AND G. W. JONES. U. S. Bur. Mines, *Repts. of Investigations* 1923, No. 2486, 6 pp.—S. and Y. (C. A. 16, 3323) have shown that a brownish gray suspension is formed when normal blood is dild. with water and treated with a mixt. of tannic acid and pyrogallol but a light carmine ppt. is formed if the blood contains CO. The former technic consisted in prep. standards from blood, but as these were not permanent, it is now proposed to prep. the standards from pigments. The method can be used not only for detg. the CO content of blood but from this value the CO content of air can be computed. The percentage satn. of blood can be detd. within 15 min. to within 5% of the truth. If air contains 0.000 to 0.05% CO the content can be detd. within 0.005% of the total vol. and if 0.18% CO is present, the results are accurate to within 0.03%. W. T. HALL

Analysis of hydrogen for traces of nitrogen. R. L. DODGE. *J. Am. Chem. Soc.* 45, 1868-91 (1923).—A measured vol. of the gas is circulated over heated CuO and the residual gas measured. Values checking within 1 part in 10 were obtained with gas mixts. contg. as little as 0.004% of N. All the cited values agree within 0.001% of the total vol. of the gas. W. T. HALL

A modification and simplification of Kjeldahl's method for determining nitrogen. H. CRRON. *Deut. med. Wochschr.* 46, 655-6 (1920).—A "Kjeldahl pear" is described by means of which  $\text{NH}_3$  of the oxidized substance can be distd. and received automatically by placing the app. which contains it in a drying oven at  $175^\circ$ . J. C. S.

The microchemical determination of hydrocyanic acid. L. ROSENTHALER AND K. SEILER. *Z. anal. Chem.* 62, 388-9 (1923).—Place the HCN soln. in a small flask with narrow neck, add sufficient satd.  $\text{CaCO}_3$  soln. to neutralize and 2-3 cc. of petroleum ether. Titrate, with shaking, until a drop in excess of 0.001 N I<sub>2</sub> soln. colors the petroleum ether. In 15 expts. cited, the greatest error was 0.0008 mg. HCN in titrating 0.0334 mg. of HCN. With larger quantities of HCN better precision was obtained. The largest quantity of HCN was 0.34 mg. W. T. HALL

Notes on citric acid. T. C. N. BROOKSMIT. *Pharm. Weekblad* 60, 626-31 (1923).—Oxidation of citric acid in AcOH soln. with  $\text{KMnO}_4$ , followed by treatment with  $\text{NH}_4\text{OH}$  and tincture of I, results in the formation of insol.  $\text{CHI}_3$ . The reaction is still more delicate with subsequent addn. of HCl. Under the same conditions succinic, lactic, oxalic, tartaric and pure malic acids give no  $\text{CHI}_3$ . Glucose, lactose, sucrose and gum

do not react. The reaction may be used as a qual. test for citric acid in effervescent Mg citrate, Fe, K and Na citrates, compound sirup of cola and lemonade sirups.

A. W. DOX

**The Lautenschläger method for determining aldehydes.** I. ROSENTHALER AND K. SEILER. *Z. anal. Chem.* 62, 385-8(1923).—Lautenschläger treated aromatic aldehydes with hydrazine and titrated the excess hydrazine iodometrically. Expts. with piperonal show that the method is inaccurate.

W. T. HALL

**The determination of phenols in coal-tar oils and crude carbofic acid.** J. B. HILL. *Ind. Eng. Chem.* 15, 799-800(1923).—In the examn. of coal-tar oils and crude phenols the method of Weiss, which consists in distg. and detg. the vol. of distillate removed by shaking with NaOH soln., is found to be satisfactory. Details are given for carrying out the analysis together with a discussion of the accuracy of the method as compared with other procedures.

W. T. HALL

**The determination of *p*-aminophenol in the presence of metol.** W. F. A. ERMEN. *Chemistry & Industry* 42, 538(1923).—Dissolve 2 g. of sample in 100 cc. water contg. an excess of HCl. Add 0.1 *N* NaNO<sub>2</sub> until free HNO<sub>2</sub> can be detected. This diazotizes the aminophenol and converts the metol into the corresponding nitrosamine, which deposits slowly in hair-like crystals. Add NaOAc and a known excess of *m*-phenylenediamine. This couples with the diazotized aminophenol but does not affect the metol compd. Keep at 25° to hasten the reaction. Finally cool and titrate the excess of *m*-phenylenediamine with a *N* soln. of freshly prepd. diazobenzene. The total nitrite used in the first titration less that required for the aminophenol gives the metol content. Dimethylaminophenol, if present, is not detd. by this method. *sym*-Dimethyl-*p*-phenylenediamine reacts like metol and will interfere if not removed at the start by washing the sample thoroughly with alc. The results obtained by the above method are accurate to about 1%.

W. T. HALL

**Sources of error in the determination of the lignin content of wood by the method of Schmidt and Graumann.** ASTRID CLEVE V. EULER. *Svensk Kem. Tids.* 35, 100-7 (1923); cf. *C. A.* 16, 273.—The method pertains to the detn. of the skeletal structure of plants, which is assumed to be carbohydrate, and the lignin. The detns. by S. and G. are not reliable in that they did not take into account the action of the ClO<sub>2</sub> upon protein, the soly. of about 10% of the carbohydrate in their procedure, and the partial soly. of lignin in dil. sulfite soln. One g. albumin combines with 8.5 mg. ClO<sub>2</sub>. ClO<sub>2</sub> does not bring coagulated albumin into soln. Samples of wood were extd. with benzene and then used in an expt. in which they were leached alternately with water and 2% Na<sub>2</sub>SO<sub>3</sub> soln. at the temp. of the water bath. The sample was washed with hot water, dried *in vacuo* over P<sub>2</sub>O<sub>5</sub>, and weighed. There was a loss of 7.3% after the first treatment, 2.3% after the second, and 0.9% after the 13th. In all a total loss of 23.4%. These figures are averages of 4 expts. on pine and spruce. The lignin content before treatment was 28.3%. After the 13th digestion and washing the lignin was 23.1%. There was therefore a loss in lignin of 14.3%, and 9.1% in the carbohydrate. The soln. of lignin in this low sulfite concn. and at this low temp. is a new observation. The nearest to this previously reported is 5% sulfite, 120°, 10 hrs. extd. 19% of the lignin.

A. R. ROSE

BYZSV, V.: *Analytical Chemistry. I. Elements of Qualitative Analysis.* (In Russian.) Moscow: Gosizdat.

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## 8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND EDW. F. HOLDEN

**Preliminary notes on the action of silver nitrate solutions on pyrite and marcasite** KAMEKI KINOSHITA. *J. Geol. Soc. Tokyo* 28, 423-31(1921); *Japan. J. Geol. Geog.* 1, 6-8A.—The dimorphous Fe sulfides, pyrite and marcasite, may be distinguished by the following test: When marcasite is boiled in 3%  $\text{AgNO}_3$  soln., its surface tarnishes to tobacco-brown, then red, and finally blue, while pyrite becomes only slightly brownish. In the reaction ferrous sulfate, sulfuric acid, and basic ferric sulfate are formed, but in different proportion for the two minerals. In such a soln. pyrite is dissolved about twice as fast as marcasite. The amount of marcasite and pyrite in mixts. of the sulfides may be roughly detd. by boiling in  $\text{AgNO}_3$  soln. and titration of the  $\text{Fe}^{2+}$  dissolved. Care must be taken to have the minerals tested and the standards in the same state of division, and other conditions strictly comparable. E. F. H.

**Augite of the Alban Hills, Italy.** H. S. WASHINGTON AND H. E. MERWIN. *Am. Mineral.* 8, 104-10(1923).—An analysis is given of augite crystals from the Fosso del Tavolato a few km. s. e. of Rome: (H. S. W.)  $\text{SiO}_2$  48.11,  $\text{TiO}_2$  1.19,  $\text{Al}_2\text{O}_3$  5.45,  $\text{Fe}_2\text{O}_3$  4.42,  $\text{Cr}_2\text{O}_3$  0.06,  $\text{FeO}$  3.74,  $\text{MnO}$  0.09,  $\text{MgO}$  12.03,  $\text{CaO}$  24.50,  $\text{Na}_2\text{O}$  0.46,  $\text{K}_2\text{O}$  none,  $\text{H}_2\text{O} + 0.09$ , sum 100.14%;  $d_{25} = 3.373$ . The crystals are black, rough and dull, with the forms  $a$ ,  $b$ ,  $m$ , and  $s$ . The material is nearly uniform, with  $\alpha$  1.703,  $\beta$  1.710,  $\gamma$  1.727 (H. E. M.). The presence of Cr and entire absence of K is especially noted. The mol. compn. is calcd. Older analyses of augites from the Alban Hills are critically discussed. E. F. H.

**Cordierite from Jotsu-ri, Shimo Kisen-men, Kankyo-nando, Korea.** IKUO KOMADA. *J. Geol. Soc. Tokyo* 29, 120-1(1922); *Japan. J. Geol. Geog.* 1, 19A.—Good crystals of cordierite occur in granite-gneiss. The color is brown to yellowish brown, the luster resinous. The prismatic crystals reach a length of 5 cm. The forms  $a$ ,  $b$ ,  $c$ ,  $m$ ,  $d$ , are developed. E. F. H.

**Harmotome from Udo, Shimane prefecture.** KAMEKI KINOSHITA. *J. Geol. Soc. Tokyo* 29, 83-9(1922); *Japan. J. Geol. Geog.* 1, 19A.—Harmotome occurs as typical penetration twins in fissures in green tuffs, with calcite, laumontite, pyrite, chalcopyrite, sphalerite. Well developed forms are  $a$ ,  $b$ ,  $c$ ,  $m$ . It is colorless to white. Analysis gave:  $\text{SiO}_2$  45.7,  $\text{Al}_2\text{O}_3$  15.7,  $\text{BaO}$  18.3,  $\text{H}_2\text{O}$  16.3,  $\text{CaO}$  1.6,  $\text{K}_2\text{O}$  [difference] 2.4. E. F. H.

**An alleged occurrence of the  $\alpha\text{CaO} \cdot \text{SiO}_2 - 3\text{CaO} \cdot 2\text{SiO}_2$  eutectic.** S. G. GORDON. *Am. Mineral.* 8, 110-1(1923).—A brownish mass said by the finder to have come from Spartansburg, S. C., is artificial, agreeing with the binary eutectic obtained by Rankin and Wright (C. A. 9, 702) at  $1455^\circ$  in their investigation of the system  $\text{CaO} - \text{Al}_2\text{O}_3 - \text{SiO}_2$ . An analysis gave: (J. E. Whitfield)  $\text{SiO}_2$  44.34,  $\text{Al}_2\text{O}_3$  2.28,  $\text{Fe}_2\text{O}_3$  0.40,  $\text{CaO}$  52.05,  $\text{MgO}$  0.56, sum 99.63%. The optical properties agreed with those found by Rankin and Wright. E. F. H.

**Korea-Manchurian Pre-Cambrian banded iron ore deposits and their enriched ore bodies.** TAKESHI ICHIMURA. *J. Geol. Soc. Tokyo* 28, 152-6, 211-20, 240-7, 295-300(1921); *Japan. J. Geol. Geog.* 1, 4-5A.—The Pre-Cambrian banded or schistose Fe ores, consisting of magnetite and hematite-bearing quartzites and quartz-schists, are extensively developed in South Manchuria and in Korea. The mode of occurrence, chem. and petrological character of the deposits and the associated enriched ore-bodies of the various localities are fully described. The Fe was probably pptd. in shallow seas as the hydrated oxide, carbonate, silicates, etc., in part, at least, through bacterial action. The sediments were later metamorphosed. E. F. H.

**The Pre-Cambrian formation of the environs of Chushu, N. Chusei-Do, Korea, with special reference to the geology and ore-deposits of the Chushu iron mine.** IKUO KOMADA. *J. Korean Assoc. Mining Eng.* 5, No. 8(1922); *Japan. J. Geol. Geog.* 2, 7-8A.—The Fe-ore deposits near Chūdshū are lenticular in form and occur in a biotite gneiss, near the top of the Pre-Cambrian formation. The ore is of compact magnetite, with hematite (by oxidation) and siliceous gang. Three analyses are given,  $\text{Fe} = 36-42\%$ . The origin is discussed. It seems probable that the ore was derived from originally concd. magnetite sands, later enriched and metamorphosed. E. F. H.

**The iron formation and associated high-grade ore bodies of the Kung-Chang Ling, South Manchuria.** TAKESHI ICHIMURA. *J. Korean Assoc. Mining Eng.* 5, No. 8, 1-25(1922); *Japan. J. Geol. Geog.* 2, 8-9A.—An Fe formation consisting of hematite-magnetite schists and gneisses covers several sq. km. Lenticular masses of high-

grade ores (over 50% Fe) are of limited occurrence in it. Most of them were formed by the action of circulating meteoric waters, but some are primary. The Fe formation, though metamorphosed, was originally sedimentary, chiefly of chem. pptn. origin. I. argues for the possibility of the formation of banded Fe ore, consisting of alternate rich and quartzose layers, by the diffusion and rhythmic pptn. of Fe compds. in colloidal silica at the time of deposition.

E. F. H.

**The origin of the ores in the Ryddarhytte ore field.** N. SUNOJUS. *Geol. För. Förh.* 45, 364-61 (1923).—The theories of Johansson and of Geijer concerning the origin of the ores are discussed and compared, with special reference to the occurrence of Mn. Geijer divides the ores into sedimentary ores, skarn ores, cordierite-quartzite ores and quartz-hiotite-almandite ores. S. recalculates his analyses of typical ores of these groups on a  $\text{SiO}_2\text{Al}_2\text{O}_3\text{FeO}\cdot\text{MnO}\cdot\text{MgO}\cdot\text{CaO}$  basis and compares the results with 4 new analyses of similar ores. The MnO content varies from 0.41 to 4.54%. The sp. grs. of the transition ores are greater than those of the original ores. From analyses of Ryddarhytte rocks expressed as quartz, albite, microcline, anorthite, muscovite, olivine, cordierite, titanite, apatite, pyrite and celsian, S. calculates that the leptyte has lost CaO 0.09, BaO 0.16,  $\text{Na}_2\text{O}$  1.22,  $\text{K}_2\text{O}$  3.51 and O 0.08, sum 5.06%; and has gained MgO 2.82 and  $\text{H}_2\text{O}$  0.89, sum 3.71%. From analyses of minerals contg.  $\text{Al}_2\text{O}_3$ , tabulated on the basis of the metallic oxides, of  $\text{H}_2\text{O}$  and of  $\text{P}_2\text{O}_5$ , S. calculates that  $\text{Al}_2\text{O}_3$  1.01,  $\text{Na}_2\text{O}$  1.19 and  $\text{K}_2\text{O}$  5.98, sum 8.18%, have been lost, and FeO 7.52, MgO 10.37 and  $\text{H}_2\text{O}$  0.97, sum 18.86%, have been gained.

W. SEGERBLOM

**Geology and ore deposits of Shoshone County, Idaho.** J. B. UMPLEBY AND E. L. JONES, JR., U. S. Geol. Survey, *Bull.* 732, 151 pp. (1923).—The Coeur d'Alene district of Shoshone Co. yielded nearly 500 million dollars worth of metals during the period 1884-1920. While 45 mineral species have been recognized among the ores of the county galena, sphalerite, pyrite and chalcopryrite occurring in a gang of siderite and quartz characterize most of the deposits. The general geology, ore deposits and some of the mines are described in detail. The future of this district appears bright. Some mines are exhausted but others have increased their output so that the output of Pb, Zn and Ag has steadily risen. Cu prospects are not so favorable.

L. W. RIGGS

**Jarbridge mining district, Nevada.** F. C. SCHRAOER. U. S. Geol. Survey, *Bull.* 741, 83 pp. (1923).—This district lies in the northern part of Elko Co. near the Idaho line. At present the district contains about 90,000 ft. of underground workings mostly in 10 mines and has 8 mills usually supplied with hydroelectric power. Within recent years this has been the leading district for Au production in Nev. The outlook for future production over any long period is not encouraging. **Geology of the Oatman Gold District, Arizona.** F. L. RANSOME. *Ibid.* 743, 56 pp. (1923).—The usual geologic and mineralogic descriptions are given. While a few of the mines have been profitably worked, the outlook for extending exploration at depths greater than 1500 ft. is not encouraging.

L. W. RIGGS

**Secondary enrichment at Eagle Mine, Bonanza, Colo.** C. E. WUENSCHE. *Trans. Am. Inst. Mining Met. Eng.* 1923, No. 1251M, 14 pp.—The Eagle mine is in the Kerher Creek mining district, Bonanza, Saguache Co., Colo. It contains manganiferous quartz veins, very low in Ag and Au at the surface, which, with depth, have much Ag with subordinate Au. Only volcanic rocks (andesite and latite) occur in the district. The Eagle mine constitutes a linked vein system of fissures in latite. Both oxidized and sulfide zones are porous enough to permit rapid and deep circulation of surface waters. The upper 100 or more feet of the veins is completely oxidized, containing quartz, psilomelane, pyrolusite, wad, limonite and fluorite (either decolorized or black). The oxidized portion contains up to 0.01 oz. Au and 0.3-6.0 oz. Ag. In the sulfide zone the veins contain quartz, rhodochrosite, green fluorite, with sphalerite, pyrite, and galena. Native Ag, argentite, proustite, pyrargyrite, and polybasite occur here. The argentiferous sulfides were introduced by ascending solns. Secondary enrichment has taken place below the oxidized zone. Rapid circulation of vadose waters, oxidation of sulfides to sulfates, and of rhodochrosite to Mn oxides, have been largely responsible for the enrichment. Assays are given of ore from the various levels; Au = 0.01-0.02 oz., Ag 2-22 oz. In the mine much *nontronite* is developed as a replacement of rhodochrosite.

E. F. H.

**The geology of the sulfide ores in the Dannemora field.** O. BÄCKSTRÖM. *Geol. För. Förh.* 45, 286-94 (1923).—The evidences that the sulfide ores are younger than the Fe ores are discussed. The ores consist mostly of blende, pyrite, arsenopyrite, galena and chalcopryrite. The Zn ore contains:  $\text{SiO}_2$  6.29,  $\text{Al}_2\text{O}_3$  2.05, FeO 6.90, MnO 0.65,  $\text{CaO}$  0.87, MgO 0.91,  $\text{CaCO}_3$  3.93,  $\text{MnCO}_3$  1.05, ZnS 64.70, PbS 0.14, FeS<sub>2</sub> 11.61, FeSAs<sub>2</sub> 0.21, CuFeS<sub>2</sub> 0.14, and Ag<sub>2</sub>S 0.015%. The pyrite contains: Fe 46.5, S 36.7, ZnS 7.87,

and As 0.05%; the arsenopyrite, As 34.36, S 19.00, Fe 34.00, Zn 6.30, and  $\text{SiO}_2$  4.36%.

W. SAGGEBLOW

The igneous rocks in the Hitachi mine, Prov. Hitachi, and their relations to the ore deposits. MANJIRO WATANABE. *J. Geol. Soc. Tokyo* 27, 441-50, 477-86(1920); 28, 1-14(1921); *Japan. J. Geol. Geog.* 1, 4A.—The country rocks at the Hitachi mine are contact-metamorphosed schists, overlain by slaty rocks and limestones. Granodiorites, with differentiated dikes and small bosses, intrude the rocks. The ore deposits are of the bedded cupriferous pyrite type. Seven large lenticular ore-bodies are found, generally following the schistosity. The ore is compact or granular pyrite with chalcopyrite and other sulfides, and few gang minerals. It is believed that the ore deposits were formed by the hydrothermal replacement of the contact-metamorphosed schists. Metallization followed the intrusion of the granodiorites. E. F. H.

The tourmaline copper veins of the Kan'an Mine, South Keisho-Do, Korea. TAKEO KATŌ AND ICHIRO OYAMA. *Japan. J. Geol. Geog.* 2, 12-7T(1923).—The country rock is a slate complex, intruded by porphyrite dikes and later by tonalite masses. The tonalite intrusion caused considerable metamorphism. The ore minerals of the veins (which are genetically related to the tonalite intrusion) are sulfides (chalcopyrite, pyrrhotite and pyrite). The veins in the tonalite are characterized by the presence of tourmaline and magnetite, those in the slaty rocks by barite and chlorite. The cause of the difference in characters of the 2 types of veins, formed by solns. from the same source at the same stage, is attributed to difference in physical conditions, mainly temp. of the wall rocks. E. F. H.

The scheelite deposit of Predazzo. C. PERRON AND L. FRONGIA. *Rass. min. mel. chim.* 58, 85-7(1923).—Scheelite occurs in the Predazzo basin in 2 distinct veins between deposits of granite and monzonite. The first vein is rose calcite, with yellowish gray salbands, with the interstices filled with granular scheelite. The vein averaged 2.34%  $\text{WO}_3$ , the salbands 1.14%. The second vein is similar except that the gang, which is white calcite, is partly replaced by quartz, with apatite, chalcopyrite and galena present. The vein averaged 3.34%  $\text{WO}_3$ , the salband 2.30%. Below is a deposit with less chalcopyrite, averaging in its vein 2.50%  $\text{WO}_3$ , in the salband 1.58%. C. C. DAVIS

Origin of the gypsum deposits at Udo. KEMEKI KINOSHITA. *J. Geol. Soc. Tokyo* 28, 100-19(1921); *Japan. J. Geol. Geog.* 1, 8-10A.—Four isolated gypsum masses occur near the Udo mine, Province of Idzumo. These occur in a shale, which has been altered in 2 ways: anamorphic silicification, and a katamorphic formation of clay. Analyses show that the change to clay is accompanied by an increase in  $\text{CaO}$ . The gypsum is both primary (alabaster and later fibrous gypsum), and secondary (crystals, selenite, and fibrous aggregates). It is probable that the gypsum was formed by a reaction between ascending solns., carrying Ca in a form other than the sulfate, and sulfuric acid resulting from the oxidation of sulfides. Associated calcite, and the increase in  $\text{CaO}$  during the alteration of the shale to clay, support this view. E. F. H.

Fluorspar mining in the western states. R. B. LADOO. U. S. Bur. Mines, *Repts. of Investigations* No. 2480, 35 pp.(1923).—All the known fluorspar deposits of N. M., Ariz., Utah, Calif., Wash., Colo., and Nev. were examined. Descriptions of the individual mines, including their geology, mining and milling methods, flow sheets, and some analyses of the ore, are given. The deposits are so small, or so inaccessible, or the ore is so poor that profitable production of gravel grade of fluorspar, acceptable to eastern steel mills, is not likely to be possible. The production of acid fluorspar in these states, from known ore bodies, probably will not exceed 100 tons annually, that of ground fluorspar will not be more than 3000 tons. E. F. H.

Mica deposits of the U. S. D. B. STERRETT. U. S. Geol. Survey, *Bull.* 740, 333 pp.(1923).—The mineralogy, mining, prepn. for market and uses of mica are described, also the mica deposits in 26 states. From 1901 to 1921 the annual output of mica averaged about 300 thousand dollars worth in value, and the mica imported during the same period averaged about 1 million dollars. Up to 1870, N. H. furnished most of the mica used in the U. S. Since then mica has been more extensively mined in N. C. and to some extent in Va., S. D., N. M. and Idaho. Several hundred mines and prospects are described. L. W. RIGGS

Talc deposits near Hai-Chen, Hang-Tien province. SADAŌ SHICHIRI AND MASUKICHI TACHIKAWA. *Chinese Mining Times* 53, 1-15(1921); *Japan. J. Geol. Geog.* 1, 6A.—Many large talc deposits of high quality occur in magnesite and dolomite beds in the vicinity of Tah-She-Chiao and Hai-Chen, South Manchuria. Deposits in 9 localities are described. The deposits are always in dolomite or magnesite, never in pure limestone, and those in the magnesite are of the higher grade. The principal

talc deposits occur as lenticular masses along the bedding planes of the country rocks, especially where they have been faulted and shattered. They are shallow, and not always accompanied by igneous rocks. The talc may have been formed by replacement of magnesite or dolomite by descending meteoric waters containing silicic acid in solution.

E. F. H.

**Porcelain clay at Shinobu-Yama in the prefecture of Fukushima.** KEITARŌ HŌJŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 1, 1-11 (1921).—**Porcelain clay at Hongo-Yama, Onuma-Gori, prefecture Fukushima.** *Ibid* 37-60. **Porcelain clay at Oki-Mura, Onuma-Gori.** *Ibid* 61-79. **Porcelain clay at Nakanokawa-Mura, Onuma-Gori.** *Ibid* 81-9. **Porcelain clay at Okinashima-Mura, Yama-Gori, prefecture Fukushima.** *Ibid* 91-102. **Clay at Ibe, Wake-Gori, prefecture Okayama.** KANJI MATSUNO. *Ibid* 2, 79-85 (1921). **Porcelain clay at Naganuma, Iwase-Gori, prefecture Fukushima.** K. HŌJŌ. *Ibid* 3, 31-46 (1921); *Japan. J. Geol. Geog.* 1, 12-3A.—With one exception, the clay deposits described are associated with Tertiary liparites and tuffaceous sedimentaries, and were formed by the alteration of those rocks. The clay at Ibe forms a thick layer underlain by gravel, and covered by the surface soil.

E. F. H.

**Fire clay in the vicinity of Taira, in the prefecture of Fukushima.** KEITARŌ HŌJŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 3, 47-82 (1921); *Japan. J. Geol. Geog.* 1, 13A.—Fire clay occurs extensively in a part of the Jo-Bau coal field, especially near Taira. There are 3 types of deposits: (1) clay beds as partings between coal seams or as under-clays, (2) decomposed arkose as the bottom bed of the Tertiary coal-bearing formation, (3) decomposed granite.

E. F. H.

**Clay at Nankwan in the prefecture of Kumamoto.** KEINSUKE IHARA. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 7, 41-9 (1922); *Japan. J. Geol. Geog.* 1, 24-5A.—The clay lies between shale and sandstone. Its extent is 1000 by 700 m., 1-10 m. thick. It is a bluish gray, homogeneous, soft and highly plastic clay, used as potters' clay and as a semi-refractory clay.

E. F. H.

**Porcelain clay and fire clay in the northern part of Nishikamo County, Aichi prefecture.** NOBUO KIVŌNŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 10, (1922); *Japan. J. Geol. Geog.* 2, 9-10A.—The clays occur in Tertiary sediments. The porcelain clay would have to be washed before use. The fire clay is associated with thin lignite beds, and is used as a fireproof material.

E. F. H.

**Clay, quartzite, pumiceous sand and fluorite in the prefecture of Miye.** KEITARŌ HŌJŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 10 (1922); *Japan. J. Geol. Geog.* 2, 10A.—A clay mined near Hazumara, Miye Co., is used in making *Banko* porcelain. Quartzite in Furuhashi, Kuwana Co. is powdered for firebrick and porcelain. The pumiceous sand occurs near Tsu. Fluorite veins, formerly mined, are found in granite, in Ishigure, Inbe Co.

E. F. H.

**Clay and quartz sand of Soma and Futaba counties, in the prefecture of Fukushima.** ROKURO KIMURA. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* No. 9, 1922; *Japan. J. Geol. Geog.* 2, 13-4A.—Clay and quartz sand occur in coal-bearing beds. The clay finds use in the manufacture of firebrick and pottery; the quartz sand for glass and in portland cement.

E. F. H.

**Clay, quartz sand and feldspar in the environs of Seto, Aichi prefecture.** NOBUO KIVŌNŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* No. 11, 1922; *Japan. J. Geol. Geog.* 2, 12-3A.—The workable clay and sand beds are intercalated in Tertiary sediments, and the feldspar occurs as pegmatite in biotite granite. The quartz sand is used for glass-making; the clay is used both for porcelain and as a refractory.

E. F. H.

**Feldspar and quartz in the environs of Ishikawa town in the prefecture of Fukushima.** KEITARŌ HŌJŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 3, 1-30 (1921); *Japan. J. Geol. Geog.* 1, 13A.—Feldspar and quartz are obtained from pegmatites, which occur associated with granites in cryst. schists. The pegmatite veins are usually banded, the middle part being composed of gigantic feldspar and quartz crystals, the outer parts of the same minerals in small crystals or graphic intergrowths. Tourmaline, garnet, beryl and mica occur in the middle of the veins.

E. F. H.

**Quartz sand at Akamatsu and Miguriya in the prefecture of Yamagata.** KYŌHIKO ISHII. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 8, 1-14 (1922); *Japan. J. Geol. Geog.* 1, 25A.—The sand layers in these 2 localities are intercalated in Tertiary sediments. The sand is white, with somewhat angular grains less than 3 mm. in diam. Two analyses are given.

E. F. H.

**Pumice sand at Iizaka in the prefecture of Fukushima.** KEITARŌ HŌJŌ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 1, 13-36 (1921); *Japan. J. Geol. Geog.*



1, 12A.—Near the town of Iizaka pumice sand beds are extensively developed and worked for abrasives. E. F. H.

**The origin of coal.** H. SCHWARZ AND G. LAUPPER. *Vierteljahrsschr. Naturforsch. Ges. Zurich* 67, 268–371 (1922).—A parallelism between coal-like material resulting from the self-beating of vegetable matter such as occurs in packed hay, and natural coal formation, is critically considered together with an extensive review of literature of the origin of coal. An exhaustive bibliography is given. E. T. ERICKSON

**The coal fields of Eraclea.** ANITA ESSINGER. *Rass. min. met. chim.* 58, 94–6 (1923).—The known area is approx. 540 sq. km. and consists of (1) 10 strata of culm at the bottom 10 m. thick, (2) 26 carboniferous strata of good quality 45 m. thick and (3) 4 strata of superior coal 4–5 m. thick. Where the carboniferous formation is not exposed, it is covered by schist and red sand, conglomerates, blue-gray limestone, multi-colored sand and tufa. The lithanthrax belongs to the semi-fat coals with long flame, analyzing in %: ash 5,  $H_2O$  2, volatile 40, fixed C 53, S 0–2.5, with calorific power 6500–7500 cal. It is not adapted for metallurgical coke but is suitable for illuminating gas or producer gas for steel, glass or ceramic mfg. C. C. DAVIS

**Contribution to the origin of petroleum. II.** E. PYHÄLÄ. *Petroleum Z.* 19, 535–9 (1923); cf. C. A. 17, 372, 2348.—A general review of the work of earlier investigators and expts. by P. which tend to confirm the theory of plant origin of petroleum. D. F. BROWN

**Study of the Torinosu limestone containing petroleum.** JUN-ICHI TAKAHASHI AND NOBUO YAMANOUCHI. *J. Geol. Soc. Tokyo* 29, 401–10, 447–70 (1922); *Japan. J. Geol. Geog.* 2, 14–6A.—Oil fills small cavities in the limestone. Compression fissures are filled with calcite and asphalt. It seems probable that the oil originated by the distn. of a part of the kerogenous limestone by geodynamical action. A number of analyses of the rock are included. E. F. H.

**The origin of oil shales.** W. G. WERKS. *Oil Eng. & Finance* 3, 643–4 (1923).—A criticism of Jones' theory (cf. C. A. 17, 2097). D. F. BROWN

**Siliceous shales in the oil measures of Japan.** JUNICHI TAKAHASHI. *J. Geol. Soc. Tokyo* 29, 17–27 (1922); *Japon. J. Geol. Geog.* 1, 19–20A.—The chem. and petrographical examn. of the siliceous shales which constitute the lower part of the Japanese oil measures is described. E. F. H.

**Micro-globulites in the oil-measure shales of Japan.** J. TAKAHASHI. *J. Geol. Soc. Tokyo* 29, 56–61 (1922); *Japon. J. Geol. Geog.* 1, 19A.—Numerous fine globules of yellowish or brownish color, 0.06–0.002 mm. in diam. in the oil-measure shales have been variously referred to resin, spores, bitumen, etc. Examn. under the metallographic microscope shows that they are composed of radiating fibers of Fe sulfide. This suggests that the shales belong to organogenetic rocks formed under anaerobic conditions. E. F. H.

**Coalmont amber.** A. W. G. WILSON. Can. Dept. Mines, *Summary Rept.* 1921, No. 586, 7–8 (1923).—This amber occurs in the coal seam at Coalmont, B. C. Sp. gr. = 1.03–1.10. It is slightly harder than the higher grades of Baltic amber. On distn. it yielded 60% of volatile products between 300° and 410°. But little succinic acid was present, on which basis the mineral would be classed as *retinite*. Nearly half of the residue after distn. was sol. in turpentine, the insol. balance being largely C from coal present as an impurity and from decompn. during distn. The mining problem at present appears to be the sepn. of com. amber from the coal. **Iron industry of British Columbia and Ontario.** A. H. A. ROBINSON. *Ibid* 8–9.—A review. **Iron oxide pigments in Ontario.** H. FRÉCHETTE. *Ibid* 9–12.—Deposits in 10 counties are described. Most of these are either small in quantity or inferior in quality as compared with the high ochers of Three Rivers, Quebec. **Miscellaneous non-metallic minerals.** H. S. SPENCE. *Ibid* 12–8.—Deposits of talc, soapstone, calcite and feldspar in Ont. and Que. are described. The most promising soapstone deposit was found 1 mile west of Wabigoon station on the main line of the Can. Pac. Ry., and is more like alberene stone of Va. than true soapstone. A remarkably pure deposit of calcite is located at Palmerston, Frontenac Co., Ont. Several hundred tons have been quarried. The most important feldspar deposits are at Montreale, Ont., and 9 miles north of Buckingham, Que., both of which are being worked. The latter named deposit is free from the usual impurities that accompany feldspar, except quartz, which is easily sepd. The  $K_2O$  content is nearly 13%. **Alkali deposits of Western Canada.** L. H. COLE AND F. M. MCNIVEN. *Ibid* 18–34.—Search for K in western Can. during the war was disappointing, but the prospecting for K compds. resulted in the discovery of large reserves of  $Na_2SO_4$ ,  $NaCl$ ,  $Na_2CO_3$  and  $MgSO_4$  in the provinces of Man., Alta., Sask., and B. C. The occurrences of these salts may be classed under 2 types: (1) Solid salts and brines

in underdrained or partially drained basins; (2) brines of flowing streams or springs. The detailed field work in this immense area consisted of a transit survey of the deposit and surroundings, surface examn. of soil and rocks, core drilling at regular intervals, sampling all springs and wells in the area and chem. analyses in the field to det. the quality of material in any deposit. The field work on other deposits, not studied in detail, consisted in visiting such deposits, obtaining representative samples from springs and pits and estg. the size of such deposits from township plans. App. and methods of work are described. Five deposits in Sask. and one each in Alta. and Man. are described in detail. About 30 analyses are given. The methods of prepg. the salts for the market are detailed, also the market conditions, trade and prices.

L. W. RIGGS

The mineral wealth of modern Turkey. F. C. ENDRES. *Umschau* 27, 280-2 (1923).—Anatolia is rich in minerals of all kinds, yet on account of the habits of the people and the political conditions but little mining is done and the mineral deposits have been but imperfectly explored. Deposits of boracite, corundum, meerschaum, gypsum, rock salt, coal, petroleum, and ores of Cu, Fe, Ag, Pb, Cr, Hg and Mn are mentioned.

L. W. RIGGS

Localities of industrial minerals and their products in Japan. NOBUO KIVONÔ. *Ind. Mineral. Survey Rept. Imp. Geol. Survey Japan* 2, 1-78 (1921); *Japan. J. Geol. Geog.* 1, 12A.—Localities of porcelain clay, refractories, glass-making materials, asbestos, K minerals, Al ores, and others, together with the localities of the industrial products in Japan are exhaustively tabulated.

E. F. H.

Petrology of the Hawaiian Islands. I. Kohala and Mauna Kea, Hawaii. H. S. WASHINGTON. *Am. J. Sci.* 5, 465-502 (1923).—In this and succeeding papers there will be presented some studies of the lavas of the Hawaiian Islands, considering the island group as a comagmatic district. The petrological relations between the several islands and their volcanoes will be compared with regard to their relative ages and their positions in the group. The rocks of Kohala and Mauna Kea are classified as *aphyric olivoclase andesite*, *aphyric olivine-olivoclase andesite*, *feldspar phryic basalt*, *aphyric basalt*, *andesine andesite*, *aphyric andesine basalt*, *ophitic andesine basalt*, *aphyric labradorite basalt*, *feldspar phryic basalt*, *chrysophyric basalt* and *picrite basalt*. The terms *phryic* and *aphyric* are used in place of *porphyritic* and *non-porphyritic*. Twenty-five analyses of these rocks by Washington are given and 7 analyses by others are quoted for comparison.

L. W. RIGGS

The alkaline rocks of Siksjöberget and Ekorråsen in Särna. N. H. MAGNUSSON. *Geol. Förh.* 45, 295-334 (1923).—Old analyses (detd. on boulders) of *särnaite* and *tingualites* from Särna are tabulated. These, when cor., indicate the compn.: orthoclase 21.09, albite 22.03, nephelinite 14.28, cancrinite 26.44, aegirite 15.53 and apatite 0.63, sum 100.00%. The essential minerals are alk. feldspar, nephelinite, cancrinite and aegirite. The 4 rock types contg. these minerals are described in detail. The *särnaite* are cancrinite-syenites and cancrinite-nephelinite-syenites, with cancrinite as the essential mineral. The *cancrinite-free nephelinite-syenites* contain feldspar, aegirite and nephelinite. The *aegirite-syenites* contain alk. feldspar and aegirite. The *syenite-pegmatites* are a coarse and diverging form of the preceding. *Särnaite* from Ekorråsen contains: SiO<sub>2</sub> 52.72, TiO<sub>2</sub> 0.50, Al<sub>2</sub>O<sub>3</sub> 19.76, Fe<sub>2</sub>O<sub>3</sub> 3.10, FeO 1.86, MgO 0.93, CaO 2.73, Na<sub>2</sub>O 11.78, K<sub>2</sub>O 3.83, P<sub>2</sub>O<sub>5</sub> 0.16, CO<sub>2</sub> 1.31 and H<sub>2</sub>O 1.44, sum 100.14%, indicating the mineralogical compn.: orthoclase 22.79, albite 18.86, nephelite 20.44, cancrinite 18.61, aegirite 8.97, diopside 8.90, titanite 1.23 and apatite 0.34%. *Särnaite* from Siksjöberget contains: SiO<sub>2</sub> 54.53, TiO<sub>2</sub> 0.23, Al<sub>2</sub>O<sub>3</sub> 18.63, Fe<sub>2</sub>O<sub>3</sub> 4.59, FeO 0.90, MgO 0.79, CaO 1.79, Na<sub>2</sub>O 12.53, K<sub>2</sub>O 2.82, P<sub>2</sub>O<sub>5</sub> 0.16, CO<sub>2</sub> 1.28 and H<sub>2</sub>O 1.21, sum 99.56%, indicating orthoclase 16.69, albite 30.82, nephelite 14.34, cancrinite 17.90, aegirite 13.26, diopside 5.64, titanite 0.56 and apatite 0.35%. The method of detg. the mineralogical compn. is described in detail. Ekorråsen feldspar is calcd. as Or<sub>54</sub>Ab<sub>46</sub> and Siksjöberget feldspar as Or<sub>54</sub>Ab<sub>46</sub>. A diagram shows how the extinction angles on the M faces vary with the chem. compn.; these angles for the glassy K-Na feldspars are throughout smaller than for the non-glassy feldspars of the same compn. A larger angle of the optical axes corresponds to a larger extinction angle on the M face. Birefringence of sections perpendicular to P and M are  $\gamma - \beta = 0.001-0.002$ . The origin of the feldspars, consisting of cores of orthoclase and mantles of albite, are discussed. *Cancrinite* has birefringence  $\omega - \epsilon = 0.027-0.029$ . It is composed of 2 silicates, nephelinite and natrolite, and of some CaCO<sub>3</sub> and Na<sub>2</sub>CO<sub>3</sub> with probable formula 3Na<sub>2</sub>Al<sub>2</sub>Si<sub>2</sub>O<sub>10</sub>·3Na<sub>2</sub>Al<sub>2</sub>Si<sub>2</sub>O<sub>10</sub>·2CaCO<sub>3</sub>·2Na<sub>2</sub>CO<sub>3</sub>. *Aegirite* occurs as small distinct needles or larger prisms. Pleochroism is strong and the colors vary:  $\alpha$  = dark bluish green,  $\beta$  = grass-green,  $\gamma$  = greenish yellow and  $\alpha > \beta > \gamma$ . The aegirite-augite interiors of the prisms

have weaker pleochroism:  $\alpha$  = grass-green,  $\beta$  = light green,  $\gamma$  = greenish yellow, and  $\alpha > \beta > \gamma$ . They have lower birefringence and larger extinction angles than does the aegirite. The structure of the alk. rocks of the 2 mountains varies greatly with the compn. The special features of the sarnaites are more pronounced with the high nephelinite and cancrinite content. The arrangement of the thin feldspar tables detd. the structure. The succession of the minerals from albite to cancrinite in the sarnaites is discussed and diagrammed. *Cancrinite-lingualite* is composed of:  $\text{SiO}_2$  50.55,  $\text{TiO}_2$  0.51,  $\text{Al}_2\text{O}_3$  15.26,  $\text{Fe}_2\text{O}_3$  5.78,  $\text{FeO}$  2.55,  $\text{MgO}$  1.27,  $\text{CaO}$  4.25,  $\text{Na}_2\text{O}$  11.71,  $\text{K}_2\text{O}$  2.88,  $\text{P}_2\text{O}_5$  0.54,  $\text{CO}_2$  2.61,  $\text{H}_2\text{O}$  2.32, sum 100.26% indicating orthoclase 17.02, albite 16.56, cancrinite 35.93, aegirite 16.78, diopside 11.58, titanite 1.25, apatite 1.18 and calcite 0.06%.

W. SEGERBLUM

The bituminous marl of Ismid, Asia Minor (HANSIRG, SANDER) 22. Mineralography as an aid to milling (THOMSON) 9.

## 9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. S. WILLIAMS

A review of the base-metal industry with special reference to the resources of the British Empire. RICHARD REDMAYNE. *J. Roy. Soc. Arts* 71, 548-63 (1923).—The metals discussed are Cu, Pb, Zn, Sn, and Al.

E. H.

Gold, silver, copper, lead and zinc in the Eastern States in 1922. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S. 1922*, Part I, 7-14 (preprint No. 2, published June 12, 1923).

E. H.

Metal-fume fever. F. KOELSCH. *J. Ind. Hyg.* 5, 87-91 (1923).—Symptoms of illness identical with those of brass founders' ague were observed in workers at a hot copper rolling plant in which the rolls were directly water-cooled. Observation and animal expts. lead to the belief that similar symptoms may occur from the inhalation of the vapor of all heavy metals. The probable mechanism of the action is discussed.

E. H.

The importance of air-granulation of blast-furnace slag as carried on by the Buderus Chemical Works. D. G. JAUTZEN. *Stahl u. Eisen* 43, 809-12 (1923).—Water-granulated slag contains very large amts. of water. The dry slag crushes much more readily than the wetted slag and is much more adapted for the cement industries. Slag is not so readily cooled by air as by water, but the greater advantages more than offset this. The chief outlet for the slag is through the cement industries.

W. A. MUELLER

Contributions to the metallurgy of the basic Siemens-Martens process and to questions of the influence of oxygen content on the mechanical properties of the ingot iron, especially in red shortness. HERBERT MONDEN. *Stahl u. Eisen* 43, 745-52 (1923).—The chief cause of red shortness is an Fe-S-O eutectic, which originates at a red heat, through the taking up of O by the FeS; this O is not again removed by deoxidation as with Si, Mn, or Al. Fe with 0.24% O<sub>2</sub> still was workable at a temp. of 900°. The red shortness decreased at the higher temps. Smaller samples of diff. runs were taken and worked down by rolls from 30 mm. and examined metallographically. The methods of treatment are outlined with a table of results over a 10-day period; the rolling temp. and sizes are also tabulated. The relation of O<sub>2</sub> content to red shortness is shown by curves. The O<sub>2</sub> content is greater for processes requiring long periods of time for treatment.

W. A. MUELLER

Mineralography as an aid to milling. E. THOMSON. *Am. Mineral.* 8, 99-104 (1923).—The methods of mineralography may profitably be extended to the examn. of ores to be milled. The coarser fragments are set in melted wax, and the hardened mass is polished in the usual way. Finer fragments must be mixed with a combination of melted wax and balsam, and carefully polished with fine powder and rouge. The nature and relative proportions of the ore minerals can then be readily detd. The same examn. may be made at various stages during the milling. Some illustrations of the method are given.

E. F. H.

Modern British foundry practice. PERCY LONGMUIR. *Iron Age* 111, 1427-9 (1923); *Foundry* 51, 497-501.—Developments in gray and malleable iron and in steel and non-ferrous castings are discussed. The effect of pouring temps. is considered.

V. O. HOMBERGER

Monel metal. JOHN ARNOTT. *Trans. Faraday Soc.* (advance proof) 1923.

F. W. COBB

**The reciprocal growth and decomposition of adjoining crystallites in conglomerate.** RUDOLF VOGL. *Z. anorg. allgem. Chem.* 126, 1-38(1923).—A detailed account of work on this topic with several different metals. The conclusions are the same as those of Carpenter and Elan (cf. *C. A.* 14, 3391).

**Laboratory corrosion tests.** W. S. CALCOTT. *Ind. Eng. Chem.* 15, 677-9(1923).—The corrosion of solids by liquids on an industrial scale is predicted from lab. data. The rate of corrosion is detd. by exposing the sample to the corrosive agent for a definite time and measuring the loss of wt. per unit area, and recalcul. the loss of wt. to the equiv. thickness removed. A definite procedure is developed for obtaining consistent results, since the latter vary with the shape of the sample, vol. of soln., time, temp. and method of cleaning. If  $W$  = g. loss by corrosion,  $A$  = in.<sup>2</sup> surface,  $S$  = d.,  $t$  = hrs. exposure, the rate of corrosion in in. penetrated per mo. =  $(43.9 W)/[ASt]$ . If  $P$  = g. loss due to grinding out pits, the rate of penetration by both normal corrosion over the entire surface and local action due to pitting =  $43.9[(W + P)/ASt]$ .

**Mechanism of the so-called dry corrosion of metals.** U. R. EVANS. *Trans. Faraday Soc.* (advance proof) 1923.—Researches are described showing the effect on "apparently dry" corrosion of the presence of volatile liquids, of contact with a dissimilar metal and of humidity. The results of these tests are used in discussing the mechanism of the process. Summary: Expts. on the behavior of "apparently dry" metals, roughened with emery, show that no corrosion occurs when they are kept over  $H_2SO_4$ , and only slow, superficial corrosion when they are kept over water. The rate of attack is greatly increased by the presence of volatile electrolytes in the air,  $SO_2$  being most dangerous to Fe and Ni,  $NH_3$  to Cu and its alloys, and HCl to Zn and Al.  $H_2S$  and  $CO_2$  somewhat increase the rate of rusting of Fe, but produce only superficial changes on other metals. The corrosion of Fe is not caused by the presence of  $NH_3$ . Corrosion of metals by volatile electrolytes appears to require some moisture, but proceeds in air distinctly unsatd. Special phenomena occur at the contact of dissimilar metals, apparent electrochem. protection being observed in some cases. The phenomena are best explained if one considers that electrochem. action occurs in the adherent (usually invisible) film of moisture. Volatile electrolytes increase the conductivity of the film and thus accelerate corrosion. Where they tend to produce hygroscopic corrosion products, more moisture is absorbed and the film thickness increased; in some cases the metal soon sheds liquid copiously and serious corrosion results.

**Effect of velocity on the corrosion of steel in sulfuric acid.** W. G. WHITMAN, R. P. RUSSELL, C. M. WELLING AND J. D. COCHRANE, JR. *Ind. Eng. Chem.* 15, 672-6 (1923).—Corrosion proceeds by the 2 processes of H-gas evolution and depolarization by dissolved O. Corrosion at rest is primarily detd. by the rate of H-gas evolution, particularly with the stronger acids. The effect of velocity is to decrease the rate of H-gas evolution. Velocity decreases the size of H bubble or throws off the gas nuclei which aid bubble formation, and hence, by increasing the work to be done in forming H, increases the overvoltage. Velocity increases corrosion by O depolarization, since it thins down the effective film through which O must diffuse. At high velocities the O effect becomes so predominating that acids varying 500-fold in concn. give the same corrosion. The net corrosion observed, being the sum of 2 effects, is chiefly detd. by gaseous H evolution at very low velocities and by O depolarization at high velocities, and passes through a min. point in the intermediate ranges.

**Resistance to corrosion of stainless steel and iron.** J. H. G. MONYFERNY. *Trans. Faraday Soc.* (advance proof) 1923.—The influence of different heat treatments, the effect of variations in compn., and the resistance of the stainless material to various corroding agents including liquids commonly found in the household as well as different chemicals are described fully.

**Quenching of soft steel from high temperatures.** M. SAUVAGROT AND H. DELMAS. *Compt. rend.* 176, 1310-3(1923).—It is shown that for low-C steel the quench effect observed in a preceding paper (cf. *C. A.* 17, 2258) is due, not to a hypothetical  $Ac_1$  point, but to the raising of the critical point with diminishing C (and Mn) content. Thus for C = 0.13%,  $Ac_1$  = 1000° approx. and for C = 0.09%,  $Ac_1$  = 1300° approx. A sample of Armco Fe, C = 0.064%, Mn = 0.065%, gave a slight increase in hardness (from 156 to 185) when quenched from 1450° but a sample contg. C = 0.05%, Mn = 0.08% gave no increase in hardness when quenched from the fusion point.

**Rapid determination of the elongation and resistance to shock of a steel by bending a notched bar.** L. JANIN. *Bull. soc. encour.* 134, 646-50(1923).—The uniform test piece is a square rod 10 × 10 × 50 mm. notched at the center by a semicircle of

5 mm. radius so that the part where the rod is bent is 5 mm. thick by 10 mm. across. The rod is bent so that the notch is on the convex side until the specimen cracks. By the use of the angle between the sides and the changes in width of the strained portion, the constants are detd. Results are quite accurate and uniform. Tables are given for different steels.

**Defects in automobile steel sheets.** GEO. F. COMSTOCK. *Iron Age* 111, 1475-80 (1923).—Causes are explained by the metallographic examn. of 20 samples.

**Inner structure of alloys.** W. ROSENHAIN. *Engineering* 115, 591-4 (1923).—Some interesting and highly suggestive views are set forth as to how the atoms are actually arranged in alloys.

**Acid-resisting alloys for use in mine water.** GEO. M. ENOS. *Coal Age* 23, 685-8 (1923).—Tests were carried out on many different alloys in slowly moving mine water with the following general conclusions: Ordinary industrial grades of iron and steel, brasses, cupro-nickels, Ni-silvers and Al and Al alloys will not withstand the action of water from coal mines. A high-Si cast iron, a high-Cr steel, two Cr-Ni-Si steels and nichrome were very resistant to the action of acid mine water. Certain hronzes, Cu-Pb alloys, Ni and monel metal may be of value for special purposes where it is not desirable to use the metals previously mentioned.

**Arc welding of cast iron.** II. W. H. NAMACK. *Gen. Elec. Rev.* 26, 304-19 (1923).—The points considered are: (1) prepn. of the parts to be welded, (2) prevention of slag inclusions in the weld metal deposited, (3) suitable values of current for the size of electrode used, (4) method of deposition of the filler metal and its effect on the strength and hardness of the weld, (5) reversed polarity vs. straight polarity, (6) effect of long vs. short arc, (7) effect of speed of welding on the softness of the weld and (8) tests of electrodes with a view to ascertaining the most suitable materials, construction, and characteristics for use in welding various grades of cast iron.

**Reactivity of coke as a factor in the fuel economy of the blast furnace** (SUTCLIFFE, EVANS) 21.

GRIGOROVITCH: **Metallurgy of Iron.** (In Russian.) Moscow: Gosizdat.

LE CHATELIER, HENRY: **Die industrielle Heizung. Zur Einführung in d. Studium d. Metallurgie.** Leipzig: Akadem. Verlagsgesellschaft. 418 pp.

MEYER, HERM.: **Lehrbuch der allgemeinen mechanischen Technologie der Metalle.** 3rd Ed. Leipzig: M. Jänecke. 298 pp.

WHITHE, F. B. HOWARD: **Nickel. The Mining, Refining and Applications of Nickel.** London: Pitman. 138 pp.

**Concentrating ores.** R. V. SMITH. U. S. 1,459,167, June 19. Oxidized ores of Ag and Pb or other metals are oiled and sulfidized in an aq. pulp, most of the original H<sub>2</sub>O is removed from the pulp, uncontaminated H<sub>2</sub>O is added and the pulp is then subjected to flotation sepn. The replacement of the H<sub>2</sub>O mixed with the pulp facilitates sepn.

**Apparatus for concentrating ores by flotation.** F. P. EGERBERG. Norwegian 36,997, Mar. 19, 1923.

**Separation of slightly magnetic ores.** RAGNVALD STOREN and REIERT JOHANSON. Norwegian 36,609, Jan. 22, 1923. The ore is sufficiently reduced in a H<sub>2</sub> atm. to form a strongly magnetic film on the particles. They are then magnetically sepd.

**Reducing iron ore or other oxides.** E. B. PRATT. U. S. 1,459,187, June 19. Fe ore or a similar oxide is charged into a refractory container together with a hydrocarbon reducing agent so as practically to fill the container and the materials are elec. heated to decompose the hydrocarbon to C and H and reduce the oxide ore which is maintained in intimate mixt. with the C and H.

**Forgeable steel.** L. P. BURROWS. U. S. 1,459,570, June 19. By adding a purplish powder produced from Ni ore to metal scrap, a steel is obtained which is capable, after being heated to 1200°, and water-tempered, of being used as a cutting tool and of being forged without further treatment.

**Carburizing the outer or inner surface only of hollow metal articles.** H. W. MCQUAID. U. S. 1,459,409, June 19. A plurality of hollow articles, e. g., roller bearing cups, are clamped together end to end so that either the inner or outer surface may be exposed alone to carburizing reagents without carburizing other surfaces.

**Removing nitrogen from alloys.** EINAR SRIØ and GEORG SRIØ. Norwegian 36,439, Jan. 2, 1923. Nitrogen is removed from ferrochrome, ferromanganese and other alloys by adding Ti oxides.

## 10—ORGANIC CHEMISTRY

CHAS. A. ROULLER AND CLARENCE J. WEST

**Bayer memorial lecture.** WM. H. PERKIN. *J. Chem. Soc.* 123, 1520-46(1923); portrait.

**Judging and dehydrating methanol with the help of magnesium.** NIELS BJERRUM AND LASZLO ZICHEMEISTER. *Ber.* 56B, 894-9(1923).—MeOH contg. 1% or more of H<sub>2</sub>O gives no gas and no ppt. with Mg; an alc. with a few parts H<sub>2</sub>O per 1,000 evolves gas vigorously and gives a ppt. of Mg(OH)<sub>2</sub>; while an alc. with less than 0.01% evolves gas violently and gives little or no ppt. Rough estimations of the H<sub>2</sub>O content can be made by dropping 0.5 g. freshly polished Mg into 10 cc. of the alc. in a test-tube protected with CaCl<sub>2</sub> and noting after 10 min. the rate at which gas is evolved, and more accurate detns. by measuring the time required for the evolution of a given vol. of gas and comparing the values with those in an empirical table prepd. from similar measurements on a standard alc. contg. known amts. of H<sub>2</sub>O (when the amt. of H<sub>2</sub>O is only 0.1-0.01%, it is better to let 0.05 g. Mg stand in 10 cc. of the alc. overnight and then note the height of the ppt. of Mg(OH)<sub>2</sub>). The MeOH must not react acid to Me orange; otherwise, the gas evolution is catalytically accelerated. Mg may be used for dehydrating MeOH (about 10 g. per l. alc.) instead of Ca, over which it has the special advantage that it does not infect the alc. with NH<sub>3</sub>, but it can be used only with an alc. contg. not more than 0.5-1.0% H<sub>2</sub>O; naturally it does not remove the traces of NH<sub>3</sub> which may be present in the alc. so that this process must be combined with the use of tartaric acid or the like when it is desired to obtain an absolutely NH<sub>3</sub>-free alc., *e. g.* for cond. detns.

C. A. R.

**Conversion of methyl chloride to methanol.** I. R. H. MCKEE AND S. P. BURKE. *Ind. Eng. Chem.* 15, 682-8(1923).—The desirability of a method to replace that of wood distn. is pointed out. Com. MeCl treated with excess of water up to 350° gave very little MeOH even in the presence of catalysts. Action of Al(OH)<sub>3</sub> upon MeCl gave very little action, but Ca(OH)<sub>2</sub> similarly gave good conversions. Results are checked by Nernst's heat theorem.

JAMES BROWN

**Olefinmonocarboxylic acids.** K. v. AUWERS, TH. MEISSNER, O. SEYDEL AND H. WISSEBACH. *Ann.* 432, 46-84(1923).—This study was undertaken with the idea of prepg. if possible stereoisomeric forms of the homologs of crotonic acid. Because of need of using mild means of synthesis, the ordinary methods could not be employed but it was found that the condensation of aldehydes with CH<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub> by means of C<sub>2</sub>H<sub>5</sub>N at room temp. gave good yields and this was therefore adopted. The compds. were characterized by their spectrochem. consts. In the synthesis of crotonic acid, only 1 form was isolated in 60% yield from AcH, CH<sub>2</sub>(CO<sub>2</sub>H)<sub>2</sub> and C<sub>2</sub>H<sub>5</sub>N. *p*-Bromophenacyl ester, m. 95-6°; partly sapond. by H<sub>2</sub>O-contg. solvents. Isocrotonic acid, m. 14.4-4.6°, d<sub>4</sub><sup>20</sup> 1.027; n<sub>D</sub> 1.44223, n<sub>D</sub> 1.44600, n<sub>B</sub> 1.45510, n<sub>F</sub> 1.46311. (This order will be given in all further values for n.) Et ester, b<sub>74</sub> 129-30.5°, d<sub>4</sub><sup>19.8</sup> 0.9246; n, 1.42256, 1.42590, 1.43285, 1.43974 at 19.6°. *p*-Bromophenacyl ester, m. 80.5-1.5°. Et  $\alpha$ -chlorocrotonate, b<sub>10</sub> 61°, d<sub>4</sub><sup>14.3</sup> 1.1073; d<sub>20</sub> 1.1023; n 1.45246, 1.45580, 1.46367, 1.47063 at 14.3°.  $\beta$ -Deriv., b<sub>10</sub> 60°, d<sub>4</sub><sup>19.2</sup> 1.1018; n 1.45639, 1.45985, 1.46836, 1.47583 at 19.2°. Et  $\alpha$ -chloroisocrotonate, b<sub>12</sub> 58°, b<sub>20</sub> 75°, d<sub>4</sub><sup>18</sup> 1.1021; n 1.45068, 1.45391, 1.46171, 1.46868 at 18°.  $\beta$ -Deriv., b<sub>10</sub> 50°, d<sub>4</sub><sup>14.4</sup> 1.0920; n 1.45317, 1.45679, 1.46561, 1.47345 at 14.4°.  $\alpha$ , $\beta$ -Pentenic acid, b<sub>7</sub> 71°, b<sub>10</sub> 99°, b<sub>17</sub> 108°, d<sub>4</sub><sup>16.55</sup> 0.9935; n 1.44892, 1.45261, 1.46161, 1.46936 at 16.55°. Chloride, b<sub>11</sub> 37°, d<sub>4</sub><sup>18</sup> 1.0653; n 1.46225, 1.46616, 1.47597, 1.48481 at 18°. Et ester, b<sub>11</sub> 42°, b<sub>18</sub> 157.6-8°, d<sub>4</sub><sup>21.9</sup> 0.9072; n 1.42737, 1.43047, 1.43788, 1.44422 at 21.9°. The ester adds Br in CS<sub>2</sub>, giving Et  $\alpha$ , $\beta$ -dibromovalerate, b<sub>14</sub> 117-7.5°, d<sub>4</sub><sup>15.4</sup> 1.6199; n 1.49527, 1.49863, 1.50656, 1.51332 at 15.4°.  $\alpha$ , $\beta$ -Pentenic *p*-bromophenacyl ester, m. 87-8°. Amide, m. 148°. Nitrile, b<sub>10</sub> 36°, d<sub>4</sub><sup>15.6</sup> 0.8311; n 1.43134, 1.43472, 1.44308, 1.44988 at 15.5°.  $\alpha$ , $\beta$ -Dibromovaleryl amide, m. 168° (decompn.). Nitrile, b<sub>10</sub> 110-1°, d<sub>4</sub><sup>17.6</sup> 1.7598; n 1.51766, 1.52133, 1.53019, 1.53881 at 17.6°. Only small amts. of the  $\Delta^4$ -isomer are formed in the above reaction. It is most conveniently prepd. (78% yield) by the reduction of vinylacrylic acid by Na-Hg and b<sub>16</sub> 93.5-95°, d<sub>4</sub><sup>16.8</sup> 0.9885; n 1.43285, 1.43560, 1.44248, 1.44821 at 18.8°. *p*-Bromophenacyl ester, m. 87-8°. Chloride, b<sub>11</sub> 53-4°, d<sub>4</sub><sup>19.9</sup> 1.0666; n 1.44716, 1.44990, 1.45733, 1.46383 at 16.9°. Amide, m. 69-70°. The Br addn. product is oily. Nitrile, b<sub>14</sub> 75°, d<sub>4</sub><sup>18.3</sup> 0.8423;

$n$  1.42084, 1.42358, 1.42998, 1.43547 at 18.8°. Tiglic acid,  $d_4^{20.6}$  0.9427;  $n$  1.42435, 0.42746, 1.43629, 1.44407. Et ester,  $b_{11}$  55.5°,  $b_{17}$  64°,  $b_{25}$  80.5–1.5°,  $d_4^{19.6}$  0.9247;  $n$  1.43236, 1.43554, 1.44290, 1.44927 at 19.5°. Angelic acid,  $d_4^{20.4}$  0.9208;  $n$  1.41674, 1.41998, 1.42846, 1.43593 at 100°. Et ester,  $b_{11}$  48.5–9.5°,  $b_{18}$  58–9°,  $b_{25}$  72–3°,  $d_4^{19.6}$  0.9178;  $n$  1.42781, 1.43102, 1.43802, 1.44435 at 19.5°. Et  $\beta,\beta$ -dimethylacrylate,  $d_4^{15}$  0.9171;  $n$  1.43335, 1.43679, 1.44462, 1.45111 at 15°. Chloride,  $b$  145–7°,  $d_4^{12.35}$  1.0652;  $n$  1.47479, 1.47980, 1.49137, 1.50231 at 12.35°. Amide,  $m$  65–6°.  $\alpha,\beta$ -Hexenic acid,  $b$  217°,  $m$  33°,  $d_4^{10}$  0.949;  $n$  1.44360, 1.44666, 1.45538, 1.46287 at 40°. Et ester,  $b_{14}$  80°,  $b_{21}$  93.4–3.8°,  $d_4^{20}$  0.9005;  $n$  1.43165, 1.43474, 1.44200, 1.44849 at 20°.  $\beta,\gamma$ -Hexenic chloride,  $b_{12}$  41–2°,  $d_4^{19.6}$  1.0142;  $n$  1.44405, 1.44730, 1.45455, 1.46038 at 19.6°. Amide,  $m$  60°. Nitrile,  $b_{21}$  103–4°,  $d_4^{16}$  0.8424;  $n$  1.43023, 1.43313, 1.43980, 1.44557.  $\alpha,\beta$ -Isohexenic acid,  $b_{12}$  106–8°,  $d_4^{16}$  0.9589;  $n$  1.44706, 1.45060, 1.45931, 1.46689. Et ester,  $b_2$  55–6°,  $d_4^{18.6}$  0.8971;  $n$  1.43043, 1.43363, 1.44079, 1.44704 at 18.5°. *p*-Bromophenacyl ester,  $m$  71–2°. Chloride,  $b_{12}$  53–4°,  $d_4^{14.2}$  1.0235;  $n$  1.45994, 1.46396, 1.47348, 1.48185 at 14.2°. Amide,  $m$  82–6°. Nitrile,  $b_{11}$  43–4°,  $d_4^{16.6}$  0.8258,  $n$  1.43245, 1.43574, 1.44367, 1.45039 at 16.5°. The  $\Delta^1$ -isomer was also formed in the reaction but was not isolated.  $\alpha$ -Bromodiethylacetyl bromide,  $b_{12}$  83°. Heating the Et ester with PhNEt, and sapon, give a mixt. of the solid and liquid  $\alpha$ -ethylcrotonic acids. The solid acid,  $m$  41–2°, has  $d_4^{56.1}$  0.9484;  $n$  1.44022, 1.44260, 1.45102, 1.45842 at 56.1°. Et ester,  $b$  167°,  $d_4^{17}$  0.9106;  $n$  1.43407, 1.43705, 1.44438, 1.45069 at 17°. Amide,  $m$  114–5°. The liquid acid,  $b$  199.5°,  $d_4^{15}$  0.9305;  $n$  1.45017, 1.45337, 1.46170, 1.46881 at 15°. Et ester,  $b$  158–9°,  $d_4^{13.9}$  0.9042;  $n$  1.42779, 1.43060, 1.43749, 1.44320 at 13.9°. Et trimethylacrylate,  $d_4^{16}$  0.9244;  $n$  1.44259, 1.44579, 1.45353, 1.46047 at 16°.  $\alpha,\beta$ -Isoheptenic acid,  $b$  226–7°,  $m$  16.5°,  $b_{18}$  123–4°,  $d_4^{14.5}$  0.9464;  $n$  1.45146, 1.45520, 1.46367, 1.47096 at 14.5°. Et ester,  $b$  190°,  $d_4^{15.2}$  0.8930;  $n$  1.43538, 1.43846, 1.44576, 1.45226 at 15.2°. *p*-Bromophenacyl ester,  $m$  87–8°. Chloride,  $b_{12}$  64°,  $d_4^{17.1}$  0.9940;  $n$  1.45887, 1.46250, 1.47202, 1.48011 at 17.1°. Amide,  $m$  127–8°; it adds Br, giving  $\alpha,\beta$ -dibromo-isoamylacetamide,  $m$  169–70°. Nitrile,  $b_{12}$  65°,  $d_4^{12}$  0.8286;  $n$  1.44020, 1.44346, 1.45132, 1.45807 at 12°.  $\alpha,\beta$ -Nonenic acid,  $d_4^{17.1}$  0.9345;  $n$  1.45398, 1.45730, 1.46473, 1.47124 at 17.1°. Et ester,  $b_{12}$  114–5°,  $d_4^{19}$  0.8901;  $n$  1.43972, 1.44263, 1.44946, 1.45544 at 19°. Chloride,  $b_{12}$  90–1°,  $b_{20}$  144°,  $d_4^{19.2}$  0.9675;  $n$  1.45738, 1.46075, 1.46876, 1.47608 at 19.2°. Amide,  $m$  118–9°. Nitrile,  $b_{18}$  99–100°,  $d_4^{15.1}$  0.8365;  $n$  1.44454, 1.44758, 1.45483, 1.46096 at 15.1°. This work clearly indicates that up to the present only crotonic acid and its alkyl derivs. have been obtained in stereoisomeric forms. C. J. W.

**Spectrochemistry of the olefinmonocarboxylic acids and their derivatives.** K. v. AUWERS. *Ann.* 432, 84–99(1923); cf. preceding abstr.—This is a discussion of the data given in the preceding abstr. and those from other published sources, from which it is concluded that spectrochem. observations can be used, in general, only to decide questions of structure but not those of configuration.  $\Delta^1$ -Tetrahydrobenzoic acid,  $d_4^{47.2}$  1.0717;  $n_D$  1.48576,  $n_H$  1.49023,  $n_P$  1.49882,  $n_Y$  1.50705. Et ester,  $b_{12}$  84–6°,  $d_4^{14.15}$  1.0032;  $n$  1.46793, 1.47167, 1.47885, 1.48558 at 14.15°.  $\Delta^1$ -Tetrahydro-m-tolulic acid,  $d_4^{73.7}$  1.0085;  $n$  1.47283, 1.47630, 1.48496, —. Et ester,  $b_{12}$  115°,  $d_4^{19}$  0.9762;  $n$  1.46413, 1.46748, 1.47473, 1.48126 at 18.45°. C. J. WEST

**Tetramethylglycerol.** PASTUREAU AND H. BERNARD. *Compt. rend.* 176, 1400–2 (1923).—Tetramethylglycerol chlorohydrin (I) (cf. C. A. 16, 2842) boiled in  $H_2O$  with  $K_2CO_3$  30 min. yields 60% tetramethylglycerol (II),  $m$  99°, by extg. the residue after evapn. with abs. EtOH. II in Et<sub>2</sub>O with powdered K yields a colorless liquid, probably the glycid,  $O.CMe_2.CHCMe_2.OH$ , which in the presence of  $H_2O$  and a trace of  $H_2SO_4$

immediately yields II quant.

I. P. ROLF

**Transformation of alanine into pyruvic acid by direct action of oxygen.** L.-J. SIMON AND LÉON PIAUX. *Compt. rend.* 176, 1227–9(1923); cf. C. A. 17, 1210.—In the biochem. transformation of  $NH_2$  acids to alcs., keto acids probably play an important part as fermentable intermediate products. Previous work on the chem. oxidation of alanine (I) with several agents gave only  $AcH$ ,  $CO_2$ , and  $NH_3$ ; but the direct action of O upon primary amines in the presence of Cu is  $RCH_2NH_2 + 2O + Cu \rightarrow$

$\text{CuO} + \text{RCHO} + \text{NH}_3$ . Scarcely a trace of  $\text{AcCO}_2\text{H}$  (II) by the same reaction was found on treating the Na salt of I for 4 hrs., but when 0.5 atom of Cu is used, the yield of II is about 4% after 8 hrs.' stirring, and with 0.25 atom of Cu, 8% after 20 hrs. With excess of alkali and with or without  $\text{NH}_3$  and Cu, any II formed disappears even without access of O; the reactions forming, resp., RCHO and II are independent; in biological phenomena or even in chem. oxidation it is probable that a more reactive, enol form of II is produced, which may account for the low yield of II. A. R. ALBRIGHT

**Action of heat on the alkaline earth salts of acid carbamides.** A. BLANCHETIERRE. *Compt. rend.* 176, 1629-31 (1923).— $\text{CO}_2$  in an aq. soln. of an  $\alpha\text{-NH}_2$  acid and an alk. earth base in the presence of phenolphthalein gives a compd. of the type  $\text{RCH.CO.O.M}^+\text{O.CO.NH}$  (I), which on boiling gives an alk. earth carbonate and the

alk. earth salt of the corresponding  $\text{NH}_2$  acid. B. was interested in the course of the action in the absence of  $\text{H}_2\text{O}$  with a view toward the reaction:  $2\text{I} = \text{M}^+\text{CO}_2 + \text{R.CH.CO.NH.CHR.CO.NH}$  (II), i. e., with formation of a diacetopiperazine

by a reaction similar to that used by Fischer:  $2\text{RCH}(\text{NH}_2)\text{CO}_2\text{Me} = 2\text{MeOH} + \text{II}$ . When dry Ba carbaminoacetate is heated to  $130^\circ$ ,  $150^\circ$  and  $170^\circ$  a cryst. Ba compd. is obtained contg. a higher % of N than the starting product. An attempt was made to purify the compd. (III) obtained at  $150^\circ$  by fractional crystn. and pptn. by means of alc. but the product was altered by  $\text{H}_2\text{O}$ . The N content of the resulting product approached that of the glycochol type, and in the case of III approached that of glycylglycine. H. E. W.

**The acetone compounds of xylose.** OLOP SVANBERG AND KNUT SJÖBERG. *Ber.* 56B, 863-9 (1923); cf. C. A. 17, 984.—The partial de-ionization of the HCl used as condensing agent in the prepn. of diacetone-xylose (I) does not necessarily indicate the formation of a Cl-contg. intermediate product, for HCl in  $\text{Me}_2\text{CO}$  (prepd. from the  $\text{NaHSO}_4$  compd.) without xylose likewise undergoes de-ionization and to the same extent as when xylose is present. The de-ionized HCl in  $\text{Me}_2\text{CO}$  soln. is probably present as an addn. product with mesityl oxide or phorone and as the acetone-xyloses can be isolated only by distn. in a high vacuum the HCl is again set free in the process and may easily lead to a decompn. of the  $\text{Me}_2\text{CO}$  compds., which are exceedingly sensitive to acids. It has been found, however, that  $\text{H}_2\text{SO}_4$  and  $(\text{CO}_2\text{H})_2$  undergo no such de-ionization in  $\text{Me}_2\text{CO}$  and may be used as the condensing agent. Thus, from 7.5 g. xylose shaken with 250 cc.  $\text{Me}_2\text{CO}$  and 7 cc. concd.  $\text{H}_2\text{SO}_4$  until dissolved (1-2 hrs. if pure, freshly dehydrated  $\text{Me}_2\text{CO}$  is used), then neutralized by shaking 1-2 days with a mixt. of  $\text{BaCO}_3$ - $\text{CaCO}_3$ , filtered, freed from the  $\text{Me}_2\text{CO}$  by distn. under atm. pressure and from the  $\text{H}_2\text{O}$  under 8 mm. and fractionated under 0.1-1.0 mm. are obtained 80% I at  $85-7^\circ$  and *monoacetone-xylose* (II) at  $140-55^\circ$ . II has a pronounced tendency to cryst. (from its own sirup, not from solvents), m.  $41-3^\circ$ ,  $[\alpha]_D^{19} -19.0^\circ$ , does not reduce Fehling soln., but is completely hydrolyzed by HCl or  $\text{H}_2\text{SO}_4$  in  $\text{H}_2\text{O}$  with such ease that its purity can be detd. by hydrolyzing it and detg. the xylose by Bertrand's method. II can also be prepd. by partial hydrolysis of I (80% from 1.3 g. I in 50 cc. of 0.16% HCl after 2.5 hrs. at  $18^\circ$ ); the reaction is unimol. ( $k = 0.017-0.023$  for  $t$  in min. in 0.20% HCl, while in 0.16% HCl it is only 0.0073). C. A. R.

**Some new derivatives of fucose.** TETSUTARO TADOKORO AND YUSUKIHIRO NAKAMURA. *J. Biochem. (Japan)* 2, 461-72 (1923).—The fucose was prepd. from the seaweed *Peletia wrightii* Yendo. The air-dried material was freed from impurities by treatment with 4% HCl and washed acid-free with water. The washed material was digested with 4%  $\text{H}_2\text{SO}_4$  for 12 hrs. at  $90^\circ$ . This was filtered and neutralized with  $\text{CaCO}_3$ ; the ppt. was removed and the filtrate evapd. to a small bulk and treated with an equal vol. of 90% alc. to ppt. gummy substances. This process was repeated several times and finally the filtrate evapd. under diminished pressure to a thick sirup. The fucose was isolated from fucose phenylhydrazone, the product being decompd. with  $\text{BzH}$  and the PhCH:NNHPh filtered off. The fucose crystd. from this sirup showed  $[\alpha]_D -120.83^\circ$ , which after 1.5 hrs. reached a const. value of  $-73.68^\circ$ ; it m.  $145^\circ$ . The phenylhydrazone m.  $170-1^\circ$ , while the phenyllosazone m.  $159-60^\circ$ . The following derivs. of fucose were made: tetraacetate, nitrate, Me fucoside and acetone fucoside. The properties of these derivs. are tabulated in detail. S. MORGULIS

**The blose of amygdalin.** RICHARD KUHN. *Ber.* 56B, 857-62 (1923).—The nature of the blose can be detd. by studying the mutarotation of the glucose set free from the glucoside by rapid enzymatic hydrolysis; after the enzyme action is stopped (e. g., with  $\text{HgCl}_2$ ) increases in rotation are observed, showing that both glucose residues are present in the  $\beta$ -form (the decreases in rotation found by Auld after interruption of the hydrolysis



of amygdalin by adding  $\text{NH}_4\text{OH}$  (C. A. 2, 2958) are due not to the mutarotation of the sugar formed but to the considerable decrease in rotation produced by adding  $\text{NH}_4\text{OH}$  to a soln. of amygdalin). The biose is therefore not maltose but *1,6- $\beta$ -glucosidoglucose*. The behavior of yeast towards amygdalin and some other sugars and glucosides (meliobiose, linamarin, glucosidogalactose, etc.) shows that enzymes, of whose homogeneity we have no guarantee, cannot always settle the configuration of sugar derivs. in virtue of their specificity and that definitions of  $\alpha$ - and  $\beta$ -glucosides based on the action of enzymes are uncertain. Therefore  $\alpha$ -glucosides should be considered the hemiacetal-like derivs. of  $\alpha$ -glucose ( $[\alpha]_D^{110^\circ}$ ) and as  $\beta$ -glucosides those of  $\beta$ -glucose ( $[\alpha]_D^{19^\circ}$ ). C. A. R.

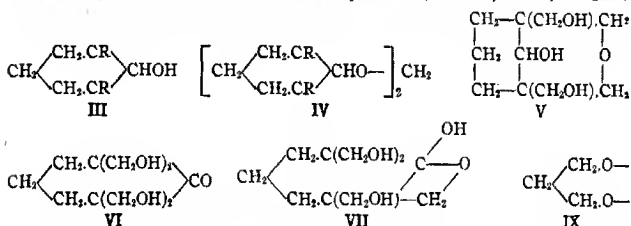
The influence of dextrans on the crystallization of maltose. L. DE HOOP AND M. J. VAN TUSSENBOEK. *Biochem. Z.* 135, 217-23(1923).—The cause of the retarded crystn. of maltose from the mixt. which results from the diastatic digestion of starch "is not yet cleared up. To ascribe this to the dextrans without further evidence is unwarranted."

Research problems in the carbohydrates. J. C. IRVING. *Rept. Brit. Assoc. Adv. Sci.* 1922, 33-48.—A general review of the chemistry of cellulose, starch and inulin, with special reference to their chem. constitution. C. J. WEST

Insecticidal principle in *Chrysanthemum cinerariaefolium*. II and III. Constitution of pyrethronic acid. RYO YAMAMOTO. *J. Chem. Soc. (Japan)* 44, 311-30; *Wakugaku Kenkyujo-Iho* (Rept. Inst. Phys. Chem. Research) 2, 54-9(1923).—Pyrethron, the insecticidal principle in *Chrysanthemum*, contains a high at. alc., an aromatic oily substance, and a liquid and a solid acid (cf. C. A. 13, 1221). Since preliminary expts. showed that when the liquid acid was condensed with the above alc., the insecticidal power was greatly increased, while each taken singly had less action, the nature of the liquid acid was studied in detail. The Et and Me esters were sepd. and analyzed. The acid is either  $\text{C}_{10}\text{H}_{16}\text{O}_2$  or  $\text{C}_{10}\text{H}_{14}\text{O}_2$ . When reduced with Pt as catalyzer, it takes up 2H; the reduced acid does not solidify even at  $-15^\circ$ . The amide of the original acid m.  $128^\circ$ ; anilide m.  $106-7^\circ$ . Pb and Ba salts were prepd. The portion b.  $110-5^\circ$  has d. 0.9685,  $n_D^{20}$  1.4762, and is optically inactive. Dihydroxy acid,  $\text{C}_8\text{H}_{10}(\text{OH})_2\text{CO}_2\text{H}$ , (by  $\text{KMnO}_4$  oxidation), m.  $146^\circ$ . The Bz and Ac derivs. resinify. The original acid,  $\text{C}_{10}\text{H}_{16}\text{O}_2$ , is named *pyrethronic acid*. With  $\text{K}_2\text{Cr}_2\text{O}_7$ , it yields a compd.,  $\text{C}_7\text{H}_8\text{O}_4$ , m.  $212^\circ$ , which when heated with HBr goes over to terpene acid. With glacial  $\text{AcOH}$ , a compd., m.  $174^\circ$ , is obtained which is identical with *cis*-coronic acid. The original is therefore *trans*-coronic acid. In the ozonized acid, trimethylene, Pr and aldehyde groups were recognized. The structure of pyrethronic acid is suggested to be  $\text{HO}_2\text{CCH}_2\text{CMe}_2\text{CHCH:CHEt}$ . S. T.

Synthesis of keto alcohols and plurivalent alcohols from cyclic ketones and formaldehyde. C. MANNICH AND W. BROSE. *Ber.* 56B, 833-44(1923).—The Tollens reaction for the prepn. of plurivalent alcs. from aliphatic aldehydes and ketones and HCHO in the presence of CaO has been applied to a no. of cyclic ketones; in 3 cases (menthone, carvone and camphor) no condensation could be effected. Cyclohexanone (I) gives a 1-, 4- or 5-valent keto alc., depending on the conditions. From 20 g. I, 115 g. of 28% HCHO, 200 cc.  $\text{H}_2\text{O}$  and 10 g. slaked lime allowed to stand several days at  $30^\circ$  with frequent stirring is obtained 24 g. 2,2,6,6-tetramethylcyclohexanol (II), m.  $131^\circ$  (all m. ps. are cor.); pentaacetate, m.  $75^\circ$ . Methylene ethers (III and IV, R = IX), from II and 30% HCHO allowed to stand 2 days with concd. HCl: III, sol. in cold 50% alc., m.  $119^\circ$  (acetate, m.  $135^\circ$ ); IV, insol. in dil. alc., m.  $242^\circ$ , mol. wt. in freezing camphor 496. 4-Hydroxy-3,5-trimethylene-3,5-dimethyltetrahydropyran (V) (2.5 g. from 5 g. II treated 10 min. at  $150-60^\circ$  with HCl gas), m.  $144^\circ$ ; triacetate, m.  $72^\circ$ . V (or the sirup obtained by treating II with HCl as above and removing the excess of HCl and other volatile products *in vacuo* at  $130^\circ$ ) in  $\text{H}_2\text{O}$  with an equal vol. of concd.  $\text{HNO}_3$  heated 4 hrs. at  $40-60^\circ$  gives 3,5-pyrone-3,5-dicarboxylic acid (6.5 g. from 10 g. II), m.  $218^\circ$ , has a strongly acid taste, loses no  $\text{CO}_2$  above its m. p. and can even be distd. *in vacuo* without decompn.; phenylhydrazone, m.  $251^\circ$ , sol. in  $\text{Na}_2\text{CO}_3$  and reprecip. by mineral acids. 2,2,6,6-Tetramethylcyclohexanone (VI or VII) (8.5 g. from 10 g. I and 34 g. of 35% HCHO in 100 cc.  $\text{H}_2\text{O}$  treated in the course of 8 days with several portions of lime (0.5 g. in all)), m.  $143^\circ$ ; tetraacetate, obtained with boiling  $\text{Ac}_2\text{O}$  and  $\text{NaOAc}$ , m.  $140^\circ$ ; bismethylene ether, obtained almost quant. from 2 g. of the alc., 3 g. HCHO and 5 cc. concd. HCl, m.  $150^\circ$ , reduced by Na in alc. to III; bisbenzylidene ether, obtained quant. from the alc., BzH and concd. HCl, m.  $230.5^\circ$ , decompd. into its components by distn. with 15 parts of 20% HCl. 2-Methylcyclohexanone, obtained in 13.5 g. yield, together with 22 g. unchanged I, from 50 g. I and

33.3 cc. of 40 vol.-% HCHO treated to incipient turbidity with H<sub>2</sub>O (about 10 cc.), then with 0.2 g. lime and, after the mixt. has become neutral, with an equal amt. of Ca(OH)<sub>2</sub>, *b*<sub>15</sub> 114–5°, sensitive to both alkalis and acids (the latter seem to effect dehydration); *monoacetate* (4.5 g. from 8.5 g. of the alc. with AcCl in CHCl<sub>3</sub>-C<sub>6</sub>H<sub>6</sub>N at –10° to –15°), *b*<sub>15</sub> 134–6°; *phenylhydrazone*, *m.* 129°, easily darkens in the air. *p*-Methylcyclohexanone with 5.5 mols. HCHO (in 2 portions at 1 day intervals) gave *4-methyl-2,2,6,6-tetracyclohexanol*, *m.* 150°; *pentacetate*, *m.* 139°. The condensation product of *o*-methylcyclohexanone with HCHO formed a non-crystallizable sirup (15–20 g.) which with BzH and concd. HCl yielded 6 g. *2-methyl-2,6,6-trimethylcyclohexanol bisbenzylidene ether*, *m.* 133°, from which with HCl was obtained the free alc., *m.* 100°. *2,2,5,5-Tetramethylcyclopentanone* (21 g. from 10.5 g. cyclopentanone, 43 g. of 35% HCHO and 0.4 g. lime in several portions), *m.* 143°, tastes sweet; *tetrabenzoate*, *m.* 144°; *bismethylene ether* (VIII) (6.3 g. from 5 g. of the alc., 25 cc. of 35% HCHO and 10 cc. concd. HCl), *m.* 182°; *bisbenzylidene ether* (19 g. from 10 g. of the alc., 12 g. BzH, 40 cc. concd. HCl and 20 cc. H<sub>2</sub>O), *m.* 206.5°. VIII (6.6 g.) with Na and alc. gives 4.5 g. *2,2,5,5-tetramethylcyclopentanol bismethylene ether*, *m.* 81°; *acetate*, *m.* 106°.



C. A. R.

**Influencing the reaction between nitrohalogenhydrocarbons and aniline by different substituents in the latter.** B. LINKE. *Ber.* 56B, 848–51 (1923).—The nitrohalogenhydrocarbon (1 mmol.) and 4 mmols. of the amine in 50 cc. of dil. alc. (d<sub>20</sub> 0.9012) were boiled 1 hr., poured into cold H<sub>2</sub>O, quickly cooled, acidified with dil. HNO<sub>3</sub>, filtered from the condensation product and washed until Cl-free; the extent to which the reaction had proceeded was measured by detg. the HCl in the filtrate as AgCl. Below are the % (av. of 2 detns.) of amine reacting with 4-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>Cl, 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Cl and 2,4,6-(O<sub>2</sub>N)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>Cl, resp.: PhNH<sub>2</sub> 0.91, 63.48, 99.41; *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> 0.31, 1.19, 77.37; *m*-compd. 0.52, 2.23, 99.07; *p*-compd. 0.42, 1.74, 94.67; *o*-ClC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 1.12, 90.34; *m*-compd. —, 11.82, 97.95; *p*-compd. 0.77, 11.30, 94.46; *o*-BrC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 1.08, 88.46; *m*-compd. —, 8.96, 94.53; *p*-compd. 0.77, 8.51, 93.48; *o*-IC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 1.01, 87.20; *m*-compd. —, 8.19, 93.83; *p*-compd. 0.31, 5.07, 93.34; *o*-HO<sub>2</sub>SC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 1.33, 79.46; *m*-compd. —, 1.74, 98.71; *p*-compd. 0.28, 1.81, 98.92; *o*-HO<sub>2</sub>CC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 1.95, 94.88; *m*-compd. —, 7.36, 99.76; *p*-compd. 0.31, 2.44, 100.11; *o*-MeC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 12.38, 97.74; *m*-compd. —, 46.95, 98.65; *p*-compd. 1.47, 69.45, 98.16; *o*-HOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> —, 35.93, 94.46; *m*-compd. —, 40.77, 99.90; *p*-compd. 2.72, 98.61, 99.69; *p*-EtOC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> 1.50, 98.91, 100.04; *o*-C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> —, 45.31, 100.04; *m*-compd. —, 61.25, 99.69; *p*-compd. 4.22, 99.17, 100.04 (in the case of the (O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>Cl and (O<sub>2</sub>N)<sub>3</sub>C<sub>6</sub>H<sub>2</sub>Cl values for 15 hrs. reaction at 7° are also given). The following *di-phenylamines* obtained in the above condensations are described: *2-iodo-2',4'-dinitro*, golden yellow, *m.* 164–5°; *3-I isomer*, orange, *m.* 135°; *4-I isomer*, orange, *m.* 185°; *2-iodo-2',4',6'-trinitro*, orange, *m.* 206°; *3-I isomer*, golden yellow, *m.* 150–2°; *4-I isomer*, golden yellow, *m.* 196°; *2-Cl analog*, orange, *m.* 160–1°; *2-Br analog*, orange, *m.* 187–9°; *2-methyl-2',4'-dinitro*, minium-red, *m.* 158–9°; *3-methyl-2',4',6'-trinitro*, crimson, *m.* 119°.

C. A. R.

**Oxidations and reductions induced by uranium salts under the influence of light.** **Anti-oxygen effect of phenols.** ALOY AND VALDIGUIÉ. *Compt. rend.* 176, 1229–31 (1923); cf. *Ibid* 137, 1 (1903); C. A. 17, 1621.—The common salts of U oxidize O acceptors such as glucose very readily in sunlight, violet U<sub>3</sub>O<sub>8</sub>·2H<sub>2</sub>O being formed; if a H acceptor such as methylene blue be present, it is simultaneously reduced but its color is restored if air be again admitted, and a second exposure to light brings about the original reaction again; the U salt plays in this case the role of an oxido-reductor ferment. The reaction is as if OH ions were carried to the O-acceptor and H ions to the H-acceptor. The addn. of a phenol, mono- or dihydric, inhibits the oxidation phenomenon, but the

phenol itself is probably oxidized to a slight extent, with corresponding formation of a red uranous salt. A short bibliography is given. A. R. ALBRECHT

**Lignin.** EMIL HEUSER AND ARNE WINSVOLD. *Ber.* 56B, 902-9(1923).—The work which had been done up to the present may be summarized in the statement that lignin and cellulose differ materially in their behavior on fusion with KOH, lignin giving chiefly aromatic substances and cellulose yielding mostly  $(\text{CO}_2\text{H})_2$ . It has now been found that by carrying out the KOH fusion of lignin in a H or N atm. the yield of aromatic substances (especially  $o\text{-C}_6\text{H}_4(\text{OH})_2$  (I)) can be materially increased. I is probably formed secondarily from  $3,4\text{-(HO)}_2\text{C}_6\text{H}_2\text{CO}_2\text{H}$  (II) which, when fused with KOH at  $240^\circ$  in air, loses  $\text{CO}_2$  with formation of 1-3% I and 14-6%  $(\text{CO}_2\text{H})_2$ , indicating that a large part of the I is again oxidized during the fusion. If the oxidizing action is limited, therefore, the yield of I should be increased without necessarily decreasing that of II, for the latter is also protected from oxidation, and as a matter of fact the yields of I increased up to 9% in H and N and that of II remained at 19% (in 1 case) while that of  $(\text{CO}_2\text{H})_2$  fell to less than 1%. The shifting of the yields in favor of I is greatly influenced by the presence of Fe, a fusion in H in an Fe crucible giving 23% I while the II completely disappeared. However, not all of the II is recovered as I; the larger part of it is destroyed, probably also owing to the catalytic influence of the Fe, but as no  $(\text{CO}_2\text{H})_2$  is found either, the destruction of the II cannot be an oxidation. Fusion of pure II with KOH in air gave about 2.5% I, 20%  $(\text{CO}_2\text{H})_2$  and 70% unchanged II; in H, 19% I, no  $(\text{CO}_2\text{H})_2$  and 77% unchanged II; in H in the presence of Fe, 26% I and no unchanged II. Ligninsulfonic acid gave on the whole the same results as lignin itself. The paper of Schmidt, *et al.* (*C. A.* 17, 1822) is criticized. C. A. R.

**Behavior of some aromatic hydroxy aldehydes.** A. WINDAUS AND H. SCHIELER. *Ber.* 56B, 846-8(1923).—BzH in dil. KOH suspension shaken several hrs. with I in aq. KI gives  $\text{BzOH}$ ;  $o\text{-HOC}_6\text{H}_4\text{CHO}$  gives  $\text{HCO}_2\text{H}$  and  $\text{HOC}_6\text{H}_4\text{I}$  or, with an excess of I,  $2,4,6\text{-I}_3\text{C}_6\text{H}_2\text{OH}$ , which is also obtained from  $p\text{-HOC}_6\text{H}_4\text{CHO}$ ;  $m\text{-HOC}_6\text{H}_4\text{CHO}$ , on the other hand, yields an *iodo-m-hydroxybenzoic acid*, m.  $219\text{--}20^\circ$ , whose *Me ether*, prepd. with  $\text{CH}_3\text{N}_3$ , m.  $49^\circ$ ;  $3,6\text{-Me}(\text{HO})\text{C}_6\text{H}_2\text{CHO}$  gives  $3,5,4\text{-I}_3(\text{HO})\text{C}_6\text{H}_2\text{Me}$ ;  $2,1\text{-C}_{10}\text{H}_6(\text{OH})\text{CHO}$  gives  $2,1\text{-C}_{10}\text{H}_6(\text{OH})\text{I}$ .  $o\text{-HOC}_6\text{H}_4\text{CHO}$  in AcOH with Pt sponge and H yields  $o\text{-HOC}_6\text{H}_4\text{Me}$  and  $2,1\text{-C}_{10}\text{H}_6(\text{OH})\text{CHO}$  yields  $2,1\text{-C}_{10}\text{H}_6(\text{OH})\text{Me}$ . C. A. R.

**Action of nitrogen trioxide on benzaldiacetyl monoxime.** OTTO DIEELS. *Ann.* 432, 1-45(1923).—In the hope of finding a more suitable method for prep.  $\text{PhCH:CHCOAc}$ , the behavior of  $\text{PhCH:CHCOC(:NOH)Me}$  (I) towards  $\text{N}_2\text{O}_3$  was investigated. The desired product was not obtained, but a *compd.*  $[\text{NCCCH}_2\text{COCH(OH)CHPh}_2(\text{N}_2\text{O}_3)]$  (II), m.  $118\text{--}20^\circ$  (decompn.), in 50 g. yield from 100 g. I. It is not very stable and gradually decomp. on keeping. When II is heated with dil. AcMe until soln. results, there seps. *o-phenyl-3,4-dioxynaleryl nitrile* (III),  $\text{PhCH}_2\text{COCOCCH}_2\text{CN}$  or  $\text{PhCH:C(OH)COCH}_2\text{CN}$ , yellow with blue surface luster, m.  $138\text{--}9^\circ$  (decompn.); it forms monoclinic holohedral crystals, observed forms, (110), (001), (100), (210), (011),  $\beta = 114^\circ 18.5$ ; d. 1.345 at  $16^\circ$  in Thoulet's soln.; av. refractive index for Na light, 1.756. III also results by the action of  $\text{C}_2\text{H}_5\text{N}$  on I at  $0^\circ$ , and in much smaller yields by the action of hot AcOH, MeOH and EtOH. The AcMe mother liquor from III on evapn. gives a reddish yellow oil, from the aq. soln. of which seps. the *compd.*  $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}_2[\text{PhC(:NOH)CH(OH)COCH}_2\text{CN}]$ , yellow, m.  $158^\circ$  (decompn.). Boiled with 73% HCl, this yields the *compd.*  $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}$ , m.  $152\text{--}3^\circ$ , the alk. soln. of which is intensely yellow.  $\text{O}_3$  acting upon III, gives BzOH and dibenzal diperoxide. III in MeOH-HCl with Zn dust gives the *compd.*  $\text{C}_{11}\text{H}_{11}\text{O}_2\text{N}$ , (IV), m.  $104\text{--}5^\circ$ , which does not add  $\text{PhNH}_2$  or  $\text{PhNHNH}_2$ , may be crystd. from concd. HCl, evolves  $\text{NH}_3$  when heated with dil. alkalis, reduces Fehling soln. and  $\text{NH}_4\text{OH-AgNO}_3$  and decomp. at  $140^\circ$ , giving CO and PhMe besides an orange-red residue which, on treatment with  $\text{O}_3$ , yields  $\text{PhCH}_2\text{CO}_2\text{H}$ . The action of  $\text{O}_3$  upon IV likewise gives  $\text{PhCH}_2\text{CO}_2\text{H}$ . Allowed to stand in an atm. of  $\text{O}_2$  for some days, IV completely decomp., giving BzH,  $\text{PhCH}_2\text{OH}$ , AcOH,  $\text{PhCH}_2\text{CO}_2\text{H}$ , and an ill-defined N-contg. product. *Bz deriv.* of IV, m.  $54.5^\circ$ . The action of  $\text{O}_2$  gives only BzOH. The thermal decompn. proceeds at a much higher temp. than that of IV ( $240^\circ$ ) and the amt. of CO evolved is far less. Boiling III in  $\text{C}_2\text{H}_5\text{N}$  for about 3 hrs. gives the *compd.*  $\text{C}_{12}\text{H}_{13}\text{O}_2\text{N}_2$ , m.  $189^\circ$  (decompn.). This is not changed by short heating with dil. acid or alkali and is only slowly attacked by  $\text{O}_3$ . Heated with AcOH and HCl in a sealed tube 5 hrs. at  $150^\circ$ , a *compd.*,  $\text{C}_{12}\text{H}_{13}\text{O}_2\text{N}$ , m.  $175^\circ$ , is formed, which decomp. on long heating with concd. KOH, but without evolution of  $\text{NH}_3$ . When warmed with MeOH contg. a little concd. HCl, III adds MeOH, giving the *compd.*  $\text{C}_{12}\text{H}_{17}\text{O}_2\text{N}$ , m.  $114^\circ$ ; the MeOH is gradually lost *in vacuo*, III being regenerated. III also adds EtOH, but the addn. product is less stable than that with MeOH. III also adds  $\text{PhNH}_2$ , giving the *compd.*  $\text{C}_{17}\text{H}_{19}\text{O}_2\text{N}_2$ , m.  $121\text{--}2^\circ$ , which is decompd. by concd. HCl into its

components. Similarly  $o$ -C<sub>6</sub>H<sub>4</sub>(NH<sub>2</sub>)<sub>2</sub> gives the *compd.* C<sub>17</sub>H<sub>11</sub>O<sub>2</sub>N<sub>3</sub>, m. 118–9°, which is also split into its components by concd. HCl. At room temp. PhNHNH<sub>2</sub> gives the *compd.* C<sub>17</sub>H<sub>11</sub>O<sub>2</sub>N<sub>3</sub>, m. 123–4°, which, heated in PhMe, evolves CO and gives PhCH<sub>2</sub>CO·NHNHPh, m. 172°. When III and PhNHNH<sub>2</sub> are boiled in EtOH, PhCH<sub>2</sub>·NHNHPh results. The action of EtOH·NH<sub>3</sub> upon III gives BzH and a *compd.* C<sub>17</sub>H<sub>11</sub>O<sub>2</sub>N<sub>3</sub> (V), m. 175°, which reduces NH<sub>4</sub>OH·AgNO<sub>3</sub> in the cold and Fehling soln. upon warming, splits off NH<sub>3</sub> upon warming with dil. alkalies and adds PhNCO in boiling MeCN, giving the *compd.* C<sub>20</sub>H<sub>13</sub>O<sub>2</sub>N<sub>3</sub>, sinters 192°, m. 207°. *Di-Ac deriv.* of V, C<sub>17</sub>H<sub>11</sub>O<sub>4</sub>N<sub>3</sub>, m. 96°. With 25% aq. EtNH<sub>2</sub> III at room temp. gives PhCH<sub>2</sub>NHET<sub>2</sub> and V. Carefully warmed with AcOH, III gives CO, PhCH<sub>2</sub>CO<sub>2</sub>H and the *compd.* PhCH<sub>2</sub>COCOCOCH<sub>2</sub>·CO<sub>2</sub>H, m. 168°; *Cu salt*, green; *Me ester*, b<sub>10</sub> 105–10°. O<sub>2</sub> leads to a mixt. of BzH, BzOH, AcOH and (CO<sub>2</sub>H)<sub>2</sub>. Boiling HCO<sub>2</sub>H splits the acid into AcOH and PhCH<sub>2</sub>CO<sub>2</sub>H. Warmed at 50–60° with PhNHNH<sub>2</sub> in AcOH, PhCH<sub>2</sub>C·(NHNHPh)CO<sub>2</sub>H is formed. If III is boiled with HCO<sub>2</sub>H, CO is evolved and PhCH<sub>2</sub>COCOCO<sub>2</sub>H and PhCH<sub>2</sub>CO<sub>2</sub>H are found in the reaction product. Other products are probably formed but they were not isolated. The action of AcOH·HCl upon III causes the splitting off of CO (and a little CO<sub>2</sub>) and the formation of the *compd.* C<sub>17</sub>H<sub>11</sub>O<sub>2</sub>N<sub>3</sub>, m. 204° (decompn.), which is a dibasic acid, and yields an *acid pyridine salt*, m. 182°, and an *acid aniline salt*, m. 187–8° (decompn.). (CO<sub>2</sub>H)<sub>2</sub> results by shaking III in Et<sub>2</sub>O with HCl. Further proof for the presence of the CN group in III is seen in the use of Hoesch's synthesis upon a mixt. of III and resorcinol, whereby the *compd.* C<sub>17</sub>H<sub>13</sub>O<sub>2</sub>N<sub>3</sub>·MeCN, m. 150° results. The MeCN is removed by boiling with H<sub>2</sub>O and the *compd.* then m. 200–3° (decompn.). III dissolves in PCl<sub>5</sub> to a clear soln. without gas evolution. AcCl also reacts with III without gas evolution, forming a yellowish red oil. Ac<sub>2</sub>O at 80° causes the evolution of CO and gives (PhCH<sub>2</sub>CO)<sub>2</sub>O.

C. J. West

**Reaction of amino acetals with phenols and phenol ethers.** O. HINSBERG. *Ber.* 56B, 852–7 (1923).—NH<sub>2</sub> acetals and their *N*-alkyl derivs. condense with phenols and their ethers in the presence of HCl or AcOH·H<sub>2</sub>SO<sub>4</sub> chiefly according to the equations 2PhOH + H<sub>2</sub>NCH<sub>2</sub>CH(OEt)<sub>2</sub> (I) + HCl = (HOC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CHCH<sub>2</sub>NH<sub>2</sub>·HCl + 2EtOH and C<sub>6</sub>H<sub>5</sub>(OH)<sub>2</sub> + I + HCl + H<sub>2</sub>O = (HO)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>CH(OH)CH<sub>2</sub>NH<sub>2</sub>·HCl + 2EtOH; univalent phenols react chiefly according to the 1st equation while plurivalent phenols tend to react according to the 2nd equation, but by changing the conditions any phenol can be made to react according to either equation.  $\alpha,\alpha$ -Bis-[2-hydroxyphenyl]- $\beta$ -aminoethane, from I and somewhat more than 2 mols. PhOH heated 3 hrs. on the H<sub>2</sub>O bath in sealed tubes with concd. HCl, m. 105°, stable in the air, has a faintly bitter taste; *HCl salt*, hygroscopic mass with about 1 HCl; *chloroplatinate*, brown-yellow.  $\alpha,\alpha$ -Bis-[2-methyl-3-isopropyl-4-hydroxyphenyl]- $\beta$ -aminoethane·HCl (4.5 g. from 5 g. I and 12 g. thymol in 50 cc. AcOH heated 6 hrs. on the H<sub>2</sub>O bath with 20 cc. concd. HCl), bitter needles with 2H<sub>2</sub>O; free base, m. 220°.  $\alpha,\alpha$ -Bis-[2-hydroxy-1-naphthyl]- $\beta$ -aminoethane·HCl (obtained in 80% yield from 5 g. I and 10.5 g.  $\beta$ -naphthol in 40 cc. AcOH allowed to stand 3 days with 75 cc. concd. HCl); free base, m. 124°.  $\alpha,\alpha$ -Bis-[*o*-dihydroxyphenyl]-*p*-methylaminoethane, from MeNHCH<sub>2</sub>CH(OEt)<sub>2</sub> and 2 mols.  $o$ -C<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> (II) in concd. HCl after 8 days, m. 143°, becomes faintly gray in the air; *HCl salt*, gives with a little FeCl<sub>3</sub> the green color reaction of II and its derivs. With I instead of 2 mols. II is obtained a mixt. of about equal parts of the above *compd.* and of *dl*- $\alpha$ -[*o*-dihydroxyphenyl]- $\beta$ -methylamino- $\alpha$ -hydroxyethane; the latter is obtained exclusively (80% of the HCl salt) from 2 g. MeNHCH<sub>2</sub>CH(OEt)<sub>2</sub> and 1.5 g. II in 8.5 cc. concd. HCl and 17 cc. H<sub>2</sub>O heated 2–3 hrs. at 100° in sealed tubes; it quickly turns brown in the air and shows in general the physiol. properties of adrenaline, although its identity with the *dl*-form of this base has not been established with certainty; *HCl salt*, is more stable than the base, gives the green reaction with FeCl<sub>3</sub>. *dl*- $\alpha$ -[*o*-Dihydroxyphenyl]- $\beta$ -amino- $\alpha$ -hydroxyethane·HCl, from 0.4 g. II and 0.48 g. I heated 2 hrs. at 100° in a sealed tube with 2 cc. concd. HCl and 4 cc. H<sub>2</sub>O, seps. with about 1 H<sub>2</sub>O. *dl*- $\alpha$ -[Trihydroxyphenyl]- $\beta$ -amino- $\alpha$ -hydroxyethane·HCl (4.5 g. from 3 g. each of I and pyrogallol allowed to stand 10 days in 6 parts concd. HCl), gives a blue-black color in H<sub>2</sub>O with FeCl<sub>3</sub>; free base, quickly turns brown in the air, has only a very slight blood-pressure raising effect but has a distinct action on the surviving uterus. *dl*- $\alpha$ -[Carboxytrihydroxyphenyl]- $\beta$ -amino- $\alpha$ -hydroxyethane·HCl, from 10 g. I and 14 g. gallic acid in 200 g. AcOH, 65 cc. concd. HCl and 20 cc. H<sub>2</sub>O after 12 hrs. at 25° and then 10 hrs. at 100°.  $\alpha,\alpha$ -Bis[ethoxyphenyl]- $\beta$ -aminoethane·HCl, from 4 g. I and 6 g. PhOEt in 10 cc. AcOH and 4 cc. concd. H<sub>2</sub>SO<sub>4</sub> heated until AcOH vapors are evolved; free base, oily.  $\alpha,\alpha$ -Bis-[*o*-dimethoxyphenyl]- $\beta$ -methylaminoethane·HCl, from 5 g. veratrole and 2.7 g. MeNHCH<sub>2</sub>CH(OEt)<sub>2</sub> in 13 cc. AcOH and 3–4 cc. concd. H<sub>2</sub>SO<sub>4</sub> heated to copious evolution of AcOEt vapors, m. 102°; free base, oily.  $\alpha$ -[Trimethoxyphenyl]- $\beta$ -amino- $\alpha$ -hydroxyethane·HCl, from 1 g. I and 1.3 g.

*vic*-C<sub>6</sub>H<sub>4</sub>(OMe)<sub>2</sub> allowed to stand 10 min. in 4 cc. AcOH and 3 cc. concd. H<sub>2</sub>SO<sub>4</sub>, m. 187°, tastes bitter; *chloroplatinate*, light yellow.  $\alpha,\alpha$ -Bis[trimethoxyphenyl]- $\beta$ -aminoethane-HCl (2.5 g. from 1 g. I and 2.6 g. *vic*-C<sub>6</sub>H<sub>4</sub>(OMe)<sub>2</sub> in 4 cc. AcOH and 3 cc. concd. H<sub>2</sub>SO<sub>4</sub> allowed to stand 15 min.), m. 199°; free base, thick oil solidifying in the desiccator. Some of the above bis[hydroxyaryl]aminoethanes have a powerful lethal action on paramacia, the thymol compd. killing them in dilns. of 1:40,000. C. A. R.

**Iodosalicylic acids.** P. BRENNANS AND C. PROST. *Compt. rend.* 176, 1626-9 (1923).—The iodosalicylic acids thus far known are 5,2- (I) and 3,2-I(HO)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H (II). B. and P. reduced 2,5-HO(O<sub>2</sub>N)C<sub>6</sub>H<sub>3</sub>CO<sub>2</sub>H to the NH<sub>2</sub> acid, also prepd. by reducing PhN:NC<sub>6</sub>H<sub>4</sub>(OH)CO<sub>2</sub>H. The HCl salt of the NH<sub>2</sub> acid in H<sub>2</sub>O with H<sub>2</sub>SO<sub>4</sub> when agitated in the cold gave the sulfate; this was diazotized at 0° and the clear soln. was turned into cold concd. HI. The mixt. warmed slowly to 80-90° evolved N; the evolution started at 40° with pptn. of I. The *acetate*, C<sub>6</sub>H<sub>3</sub>I(OAc)CO<sub>2</sub>H, obtained with Ac<sub>2</sub>O, m. 166°. II was prepd. like I. 3,5-Diiodosalicylic acid was obtained by treating I in alc. with I and HgO, and also from II. The *acetate*, m. 153°.

H. E. WILLIAMS

**Betulin.** K. ALB. VESTERBERG. *Ber.* 56B, 845(1923).—In connection with the papers of Schulze and Pieroh (C. A. 17, 730) and Discheudorfer (C. A. 17, 2573). V. points out that he has been studying betulin for 2 yrs. (cf. the brief note in his paper on amyryn, *Ann.* 428, 426, and that he has found that the most probable formula for betulin is C<sub>30</sub>H<sub>48</sub>(OH)<sub>2</sub> and that it is a bivalent alc. closely related to the univalent  $\alpha$ - and  $\beta$ -amyryns. The detailed report of these investigations will appear shortly in the *Annalen*. C. A. R.

**Symmetrical and mixed esters of campho-1-formic-1-acetic acid and their saponification products.** A. HALLER AND L. PALFRAY. *Compt. rend.* 176, 1193-7(1923); cf. *Ibid* 141, 13(1905).—*Di-Me-campho-1-formate-1-acetate* (I), C<sub>14</sub>H<sub>18</sub>-C-CO<sub>2</sub>Me



b<sub>12</sub> 207°, [ $\alpha$ ]<sub>D</sub> 65.70°, was prepd. by forming the Na compd. of Me campho-1-formate with MeONa or NaNH<sub>2</sub> and treating the product with ICH<sub>2</sub>CO<sub>2</sub>Me which gives yields higher than the Cl or Br deriv. There have also been prepd. the corresponding esters: *di-Et* (II), b<sub>14</sub> 199-200°, [ $\alpha$ ]<sub>D</sub> 59.72°; *Me Ph* (III), b<sub>12</sub> 233-5°, [ $\alpha$ ]<sub>D</sub> 41.63°; *benzyl Me* (IV), b<sub>14</sub> 265-70°, [ $\alpha$ ]<sub>D</sub> 46.17°. Alkalies even in excess sapon. only the Ac group of each of these esters, and the same keto-ester acids result from treatment of the di-esters with HI or H<sub>2</sub>SO<sub>4</sub>; the sapon. temp. should not exceed 150°. Sapon. of I and of III gives *Me campho-1-formate-1-acetic acid* (V), m. 177-8°; of II, the *Et ester*, m. 117°; of IV, the oily *benzyl ester*. When either I or V is heated in a sealed tube at 180-90° with concd. HCl for 10 hrs., *camphoacetic acid*, CO<sub>2</sub>C<sub>6</sub>H<sub>11</sub>CHCH<sub>2</sub>CO<sub>2</sub>H, m. 84-5°,

[ $\alpha$ ]<sub>D</sub> in abs. alc. 72.58°, is obtained. It is emphasized that the presence of both the -CH<sub>2</sub>CO<sub>2</sub>H and the -CO<sub>2</sub>R groups on the same C atom of the camphor mol. greatly increases the stability of the latter group.

A. R. ALBRIGHT

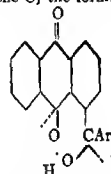
**Camphor and nitrophenols.** N. N. EFREMOV. *Bull. acad. sci. Russie* 1919, 255-86.—An investigation was made of the influence of the presence of NO<sub>2</sub> groups upon the systems camphor-phenols, for which latter the existence of definite mol. compds. has been definitely proved by different authors. The principal method used consisted in taking cooling and heating curves with Kurnakov's photo-registering pyrometer (Cu-constantan couple). For those concns. and those systems where the velocity of crystn. was too low and the phenomena of undercooling could not be avoided by inoculation, Alexeiev's method for m.-p. detns. was applied. E. modified this method so far as to make it possible to identify the eutectic temp. and compn. NO<sub>2</sub> groups oppose definitely the formation of any intermol. compds. between camphor and substituted phenols. Photomicrographs are given for 20 and 70% picric, 20 and 70% styphnic, and 25 and 70% nitroresorcinol mixts. The eutectic temp., eutectic compn., and limits of solid soln. resp., are: *o*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH 45%, 11.8°, 100-92%; *m*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH 41.5%, 16°, 100-65% (approx.); *p*-O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>OH 36%, -2°, 0-13 and 70-100% (approx.); 2,4-(O<sub>2</sub>N)<sub>2</sub>C<sub>6</sub>H<sub>3</sub>OH 30.7%, 69.3°, 93-100%; picric acid 30.5%, 66.4°, 96-100%; 2-nitroresorcinol 39.3%, 4.6°, 90-100%; 2,4-dinitroresorcinol 29%, 47.2°, 0-15 and 68-100% (approx.); styphnic acid 25.3%, 82.6°, 89-100%; O<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>(OH)<sub>2</sub> 33.2%, 26.4°, 0-23 and 73-100% (approx.); 4,1,2-O<sub>2</sub>NC<sub>6</sub>H<sub>3</sub>(OH)<sub>2</sub> 38%, 25.8°, 0-8 and 86-100% (approx.). M. G. KORSUNSKY

**Decomposition of aromatic ketones.** ALPHONSE MAILHE. *Bull. soc. chim.* 33, 632-7(1923).—The catalytic decompn. of aromatic ketones at 550-600° in contact with Cu turnings is analogous to that found for the aliphatic ketones (cf. C. A. 17, 263).

The decompn. is rendered more difficult when the CO group is attached directly to the ring. The chain is broken on each side of the CO group, giving CO<sub>2</sub>, an aromatic residue, which hydrogenates to an aromatic hydrocarbon, and an aliphatic hydrocarbon, which may further decomp.

**Purpurogallin.** J. HERZIG. *Ann.* 432, 99-114(1923).—If tetramethylpurpurogallin (I) is warmed 0.5 hr. with 20% EtOH-KOH or for 5 hrs. with a 5% soln., an ethyltrimethylpurpurogallin (II), m. 114-5°, results. EtOH alone does not give this compd. I cannot be regenerated by the action of MeOH-KOH. Et<sub>2</sub>SO<sub>4</sub> and trimethylpurpurogallin (III) give an isomer of II (IV), m. 105-7°, mixed m. p. with II, 85-90°. Concd. H<sub>2</sub>SO<sub>4</sub> at 100° with I or III gives a dimethylpurpurogallin (V), m. 193-5°. Diacetate, m. 180-1°. Concd. H<sub>2</sub>SO<sub>4</sub> with II gives a mono-Me deriv., m. 193-4°, while IV gives a compd. m. 158-62°, which is a mixt. of the mono- and di-Me derivs. Each of these products with CH<sub>3</sub>N<sub>2</sub> gives III, m. 179-80°. III with alkali and Zn dust gives an amorphous product contg. 2MeO groups. In the same way, V gives a product with only 1MeO group. Purpurogallin in dil. alk. soln., treated with a stream of air, first gives a deep violet soln., gradually changing to green and then to a reddish brown. No cryst. products could be isolated.

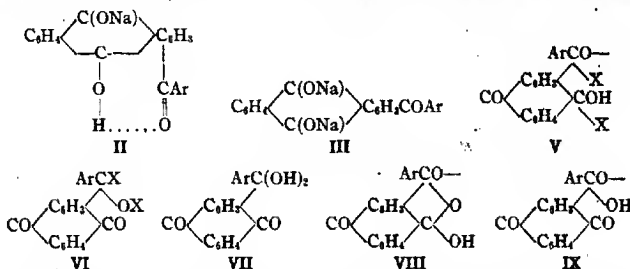
C. J. WEST  
A new class of free organic radicals. II. ROLAND SCHOLL WITH HERBERT HÄHLE. *Ber.* 56B, 918-36(1923); cf. C. A. 16, 1243.—It was shown in the 1st paper that the violet-blue reduction products of the 1-benzoylanthraquinones are benzoyl-9-oxanthronyls, a new class of free org. radicals; that they have the monomol. structure was shown for 1-*p*-chlorobenzoyloxanthronyl (I) in boiling PhNO<sub>2</sub> and it has now been found to be the case also in freezing PhNO<sub>2</sub> (mol. wt. found, 330), in 417 parts of which I is sol. at 10-2°. To explain the lack of reactivity of the H on the O, the formula



of these radicals as originally proposed is altered to the form

to indicate that the H is bound by forces of like kind to both O atoms, that the bonds between the O atoms and the adjoining C atoms are intermediate in value between single and double bonds and that these radicals do not contain a 3-valent C atom, like the triarylmethyls and metal ketyls, but two C atoms which are together 7-valent or two 3.5-valent C atoms, so to speak. These views accord well with the behavior of the new radicals towards Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub>, free O<sub>2</sub> and other oxidizing agents and halogens. As pointed out in the first paper, cold alk. Na<sub>2</sub>S<sub>2</sub>O<sub>4</sub> converts I into the inner complex II (which regenerates I in the air) and this by hot NaOH is changed into the "open" 1-arylanthrahydroquinol (III), which now in alk. soln. in the air no longer regenerates I but gives the aroylanthraquinone (IV). O<sub>2</sub> does not appreciably react with I in PhNO<sub>2</sub> in the dark at room temp. in 4 hrs.; at higher temps. it reacts only slowly; in daylight it reacts even at room temp. but the I disappears only about twice as rapidly as when it is illuminated under O<sub>2</sub>-free CO<sub>2</sub>; in any case the reactivity is very small as compared with that of radicals with ordinary 3-valent C. S. and H. believe that the disappearance of the I both under O<sub>2</sub> and under CO<sub>2</sub> is due to dehydrogenation to the IV. When titrated to disappearance of the color, I uses up one HO with H<sub>2</sub>SO<sub>4</sub>, 1 atom O with CrO<sub>3</sub>, three HO with HMnO<sub>4</sub> and 3 atoms of Br. The primary product, C<sub>20</sub>H<sub>11</sub>O<sub>2</sub>ClBr<sub>3</sub>, of the action of Br was isolated, although not quite pure, as a yellow amorphous hygroscopic substance by adding solid I to an excess of Br; HBr is evolved during the reaction; heated with H<sub>2</sub>O or AcOH, the product gives off Br and forms IV. The product of the action of HMnO<sub>4</sub> was not isolated; when KI is added after the titration to the disappearance of color and the solvent PhNO<sub>2</sub> is distd. off with steam free I and IV are obtained. It is believed that 2 Br atoms (or 2 HO groups) first add to the 2 radical C atoms with formation of the intermediate radicals V (X = Br or OH) which then adds a 3rd Br atom (or HO group) and splits off HBr (or H<sub>2</sub>O) with formation of VI. The action of H<sub>2</sub>SO<sub>4</sub> is so slow, compared with that of Br or HMnO<sub>4</sub>, that only 1 of the radical C atoms is hydroxylated and the resulting VII is then dehydrated to IV. The reaction between I in concd. H<sub>2</sub>SO<sub>4</sub> with CrO<sub>3</sub> in H<sub>2</sub>SO<sub>4</sub> or between I in PhNO<sub>2</sub> and CrO<sub>3</sub> in AcOH proceeds very rapidly and gives IV; the 1 atom of O consumed probably adds to both radical C atoms with formation of the radicals VIII or IX which dimerize to peroxide-like compds. In this

connection Schaarschmidt's emerald-green sulfate of I (C. A. 9, 2256) was prepd. and purified with chloral; it has the compn.  $C_{21}H_{17}O_5Cl_2 \cdot 2H_2SO_4$ . With *p*-O:  $C_6H_4$ :O in AcOH I gives the almost colorless *hydroquinol bis[chlorobenzoylhydroxyanthronyl] ether* (X),  $C_{24}H_{16}[OAr(OH)C_6H_4(CO)_2C_6H_4]_2$ , which begins to dissociate at 100°, becoming blue-violet, and at 130–40° it assumes the deep blue-violet color of I and O:  $C_6H_4$ :O sublimates off, a process which in  $CO_2$  in the dark is quant.; in soln., the dissociation begins at room temp. The results of the expts. indicate that the formation of X proceeds in 2 stages—slow formation of a 1:1 addn. product followed by a rapid addn. of a 2nd mol.



of I. I is best prepd. by Schaarschmidt's method (50% crude or 35% pure product) from the IV with Al-bronze and concd.  $H_2SO_4$ , although it may also be obtained with  $SnCl_2$  in AcOH or  $FeSO_4$  in AcOH-HCl. X seps. from  $CHCl_3$  in yellowish white tables with 1 mol. solvent. C. A. R.

Preparation of homologs of isatin; preparation of 7-methyl-5-bromoisatin. MARCELLE RESSY AND ANDREI P. ORYODOCSU. *Bull. soc. chim.* 33, 637–40 (1923).—*o*-Toluidine was acetylated and then brominated, giving *bromoacetyl-o-toluidine*, m. 156.7°. *Bromobenzoyl-o-toluidine*, straw-colored, m. 115°, was obtained by benzoylating and then brominating *o*-toluidine. The Br goes in para to the  $NH_2$ . Sapon. with alc. KOH and distn. with steam gave *bromo-o-toluidine* (I), m. 57°.  $NH_2OH \cdot HCl$  and I were heated on a water bath below 75° for 15 min.; chloral hydrate was then added slowly and the mixt. heated for 1 hr. The product was purified with NaOH, crystd. from alc., and hydrolyzed, giving *isonitrosobromoacetyl-o-toluidine*, m. 181°. With hot  $H_2SO_4$  this gave an intense violet soln. which, when added to water, pptd. the crude 7-methyl-5-bromoisatin, recrystg. in deep, orange-red prisms, m. 240°. It gives a *phenylhydrazone*, brown needles, m. 252°, and an *oxime*, m. 249°, sol. in NaOH, repptd. by acid. The increased intensity of the color is due largely to the introduction of the Br, as the color of methylisatin was found to resemble that of isatin. A. C. PURDY

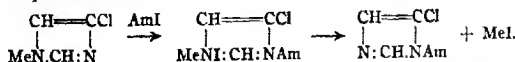
Oxalic acid derivatives of benzo- and *p*-toluacetodinitrile. ERICH BENARY, HELENE SOENDEROP AND ERICH BRNNEWITZ. *Ber.* 56B, 910–7 (1923); cf. C. A. 16, 1079.—It has been shown in the earlier paper that diacetodinitrile (I) condenses with  $(CO_2Et)_2$  in the presence of NaOEt to a *N*-deriv. while  $EtO_2CCOCl$  in  $C_2H_5N$  gives an isomeric *C*-deriv. It seemed probable, therefore, that the products obtained by E. v. Meyer from benzo- (II) and *p*-toluacetodinitrile with  $(CO_2Et)_2$  are also *N*- and not, as he believed (C. A. 8, 3045), *C*-derivs., and such has proved to be the case. Here, too, isomeric *C*-derivs. are obtained by the  $C_2H_5N$  method. I and II with  $(COCl)_2$  in  $C_2H_5N$  gave the normal *C*-derivs.,  $[COCH(CN)CR:NH]_2$ . *C-Ethoxalylbenzoacetodinitrile* (IV),  $PhC(NH)CH(CN)COCO_2Et$ , obtained in 56% yield from 10 g.  $EtO_2CCOCl$ , m. 7 g.  $C_2H_5N$  and 100 cc.  $Et_2O$ , decomps. 165–7°, sol. in  $Me_2CO$ , alc.,  $MeOH$ ,  $AcOEt$ ,  $CHCl_3$  and  $AcOH$  with yellow color, gives almost quant. with  $PhNHNH_2$  in 50%  $AcOH$  after 15 min. on the  $H_2O$  bath 1,3-diphenyl-4-cyanopyrazole-5-carboxyphenylhydrazide (V), m. 215–6°, reduces hot Fehling soln., gives a transient violet color with  $FeCl_3$  in concd.  $H_2SO_4$ , partially dissolves with a deep red color in cold NaOH; boiled several hrs. with *N* NaOH, it gives  $NH_3$  and 1,3-diphenyl-4-carbamidopyrazole-5-carboxyphenylhydrazide, m. 269°, insol. in cold  $Na_2CO_3$ , easily sol. in cold NaOH, gives a violet color with  $FeCl_3$  in concd.  $H_2SO_4$ . 1,3-Diphenyl-4-cyanopyrazole-5-carboxylic acid, from IV with  $KMnO_4$  in cold  $Me_2CO$ , m. 216–7° (gas evolution), easily sol. in  $Na_2CO_3$  and NaOH, on long boiling with 10% NaOH gives  $NH_3$  and 1,3-diphenylpyrazole-4,5-dicarboxylic acid, m. 197° ( $CO_2$  evolution). Oxalylbis[benzoacetodinitrile], from 7 g. II, 4.3 g.  $C_2H_5N$  and 3.2 g.  $(COCl)_2$  in  $Et_2O$ , m. 217–8° (decompn.), gives V

with  $\text{PhNHNH}_2$  in AcOH on the  $\text{H}_2\text{O}$  bath. *Benzacetodinitrile-C-oxalamide*,  $\text{PhC}(\text{NH})\text{CH}(\text{CN})\text{COCONH}_2$ , from IV allowed to stand in alc.  $\text{NH}_3$ , begins to decomp.  $198^\circ$ , m.  $212-3^\circ$ . IV gradually dissolves in the calcd. amt. of  $N$  NaOH and dil. HCl ppts. *benzoacetodinitrile-oxalimidolactone*,  $\text{C}_7\text{H}_5\text{O}_2\text{N}_3$ , m.  $272^\circ$  (decompn.), quite easily sol. in cold dil.  $\text{Na}_2\text{CO}_3$ , gives with  $\text{PhNHNH}_2$  in hot 50% AcOH *C-benzoacetodinitrile-oxalphenylhydrazide*, m.  $279-80^\circ$ , insol. in cold  $\text{Na}_2\text{CO}_3$  and dil. NaOH, gives an olive-green color with  $\text{FeCl}_3$  in  $\text{H}_2\text{SO}_4$ . IV heated with  $\text{H}_2\text{O}$  at  $60-70^\circ$  and evapd. *in vacuo* yields the  $\text{NH}_4$  salt, m.  $181-3^\circ$ , of *benzoacetodinitrile-C-oxalic acid* (VI), which with  $\text{Cu}(\text{OAc})_2$  gives the dark green voluminous Cu salt; this with mineral acids at once yields the imidolactone, and in  $\text{Et}_2\text{O}$  with  $\text{H}_2\text{S}$  gives the free VI, m.  $132^\circ$  (decompn.), very easily sol. in  $\text{Na}_2\text{CO}_3$ , slowly sol. with decompn. in cold  $\text{H}_2\text{O}$  and alc. v. Meyer's isomer, m.  $90^\circ$ , of IV and the corresponding acid, m.  $259^\circ$ , and amide, m.  $199^\circ$ , are the  $N$ -derivs.,  $\text{PhC}(\text{CHCN})\text{NHCOCOH}$ , etc. *C-Ethoxalyl-p-toluacetodinitrile*, m.  $132-3^\circ$  (decompn.). *1-Phenyl-3-p-tolyl-4-cyanopyrazole-5-carboxylphenylhydrazide*, m.  $224-5^\circ$ , gives a violet color with  $\text{FeCl}_3$  in  $\text{H}_2\text{SO}_4$ , converted by heating 1 hr. with 5% KOH into the *4-carbamido deriv.*, m.  $268-8^\circ$ , and by  $\text{KMnO}_4$  in  $\text{Me}_2\text{CO}$  into *1-phenyl-3-p-tolyl-4-cyanopyrazole-5-carboxylic acid*, m.  $208-9^\circ$ . *p-Toluacetodinitrile-C-oxalamide*, begins to decomp.  $175^\circ$ , m.  $195-6^\circ$ . *Imidolactone*, chars  $301^\circ$ , insol. in  $\text{Na}_2\text{CO}_3$  and  $\text{NH}_4\text{OH}$ . *Free acid*, m.  $149^\circ$  (decompn.);  *$\text{NH}_4$  salt*, m.  $165-6^\circ$  (decompn.). *C-Oxalyl-bis[diaacetodinitrile]*, slowly chars from  $198^\circ$  up. C. A. R.

**Quaternary salts of imidazoles.** JEAN SARASIN. *Helvetica Chim. Acta* 6, 370-6 (1923).—1-A- and 1,5-Dimethylimidazole give the same methiodide with MeI. The identity of  $\text{MeC}:\text{CH.NMe.CH:N.MeI}$  and  $\text{MeC}:\text{CH.NMeI.CH.NMe}$  may be ex-

plained by the oscillation of the double bond and the halogen between the 2 N atoms. The decompn. of these quaternary imidazoles when heated and the influence of electro-negative groups on the oscillation were considered by S. to be worthy of study. 1-Methylimidazole-MeI when heated *in vacuo* gave MeI and 1-methylimidazole (I) b.  $195-6^\circ$ . The *picrate*, m.  $158-9^\circ$ . The methiodide gave I and 1-ethylimidazole with EtI and MeI. The isoamidide gave I and 1-isoamylimidazole. The bromobenzylate gave only traces of 1-benzylimidazole but gave I and PhBr. This decompn. is probably due to the  $\text{PhCH}_2$  and not to Br. The quaternary salts behave as if the Cl had no preferred position. The methiodide of 1-methyl-4(5)-chloroimidazole warmed *in vacuo* at  $220-30^\circ$  gave quant. MeI and a new 1-methyl-5(4)-chloroimidazole, b.  $250-2^\circ$ . The 2 compds. with Na and alc. gave the same compd. The methiodide gave MeI and 1-ethyl-5(4)-chloroimidazole, b.  $258-60^\circ$ , which on reduction gave 1-ethylimidazole. The isoamidide gave 1-isoamyl-5(4)-chloroimidazole, b.  $286-8^\circ$ . The bromoallylate gave 1-allyl-5(4)-chloroimidazole, b.  $129^\circ$ . The bromobenzylate gave no trace of benzylchloroimidazole. These data establish the constitution of 1-methyl-4(5)-chloroimidazole. The I in its oscillation between 1 and 3 in  $\text{HC}:\text{CCl.NMe.CH}^2\text{NMeI}$  is

subjected to the influence of Cl and it is fixed on the 1-position. On heating the compd. the I is eliminated with the Me fixed to the same N atom. 1-Methyl-4-chloroimidazole (II) is very probably Wallach's compd. b.  $200^\circ$  (*Ann.* 184, 51(1877)). The 1-methyl-5-chloro deriv. b.  $250-2^\circ$ . The ethyl-, allyl-, isoamyl-chloroimidazoles obtained by decompn. the quaternary salts of II are 1-alkyl-5-chloroimidazoles formed in accordance with the equation



The methiodide, ethiodide, isoamidide and bromobenzylate of 1-methylimidazole were prepd. by boiling the reagents for several hrs. in 5 times their wt. of dry  $\text{C}_6\text{H}_6$ . 1-Methyl-4-chloroimidazole methiodide, m.  $174-5^\circ$ , ethiodide (III), m.  $156-7^\circ$ , isoamidide (IV), m.  $118-9^\circ$ , bromoallylate, m.  $141-4^\circ$ , and bromobenzylate, m.  $107-9^\circ$ . When these salts were heated under 12 mm. (the former at  $260-300^\circ$  and the Cl derivs. at  $220-30^\circ$ ) alkyl halides and the corresponding alkylimidazoles were formed. 1-Methyl-5-chloroimidazole, b.  $250-2^\circ$ , was obtained by heating the methiodide. The picrate m.  $166-7^\circ$  and with Na in alc. gave I. 1-Ethyl-5-chloroimidazole, b.  $258-60^\circ$ , was obtained by distg. III, and 1-isoamyl-5-chloroimidazole, b.  $286-8^\circ$ , was obtained by distg. IV. 1-Allyl-5-chloroimidazole, b.  $129-31^\circ$ , was also prepd. H. E. W.

**New syntheses in the imidazole group.** JEAN SARASIN. *Helvetica Chim. Acta*, 6, 377-85(1923).—S. desired to synthesize histamine, pilocarpine and their homologs



and endeavored to obtain 4- or 5-allyl derivs. of imidazole (I). 1-Methyl-4-chloroimidazole (II) with  $C_2H_5Cl$  in  $Et_2O$  or petr. ether and Na yielded 1-methylimidazole, h. 195-6°, and also diallyl by reduction. Further work showed that II does not yield its Cl easily, failing to interact with Grignard reagents,  $NaHCO_3$ ,  $Et_3NH$  or K1 up to 150°. When heated to 140° with 40%  $CH_3O$  in tubes for 4 hrs., II gave 1-methyl-2-methylol-4-chloroimidazole, m. 109-10°. When warmed at 160-70° for several hrs. with red P and H1 it yielded after distn. *in vacuo* and treatment with  $K_2CO_3$ , 1,2-dimethylimidazole (Jowett and Potter, *J. Chem. Soc.* 83, 469(1903)), b. 205-6°. The picrate m. 179-80°.  $AcCH(CO_2Et).C_2H_5$  was dissolved in cold KOH and after 24 hrs.  $NaNO_2$  was added by drops to the iced mixt. The isonitrosoacetone formed was purified by soln. in NaOH, the soln. being extd. by  $Et_2O$ . The isonitrosoallylacetone formed m. 46°. It was treated in glacial AcOH with Sn and HCl for 30 min. at 50° and the product was then treated with  $H_2S$ . Aminoallylacetone-HCl (III), m. 152-3° (decompn.). 4(5)-Methyl-5(4)-allyl-2-mercaptoimidazole (IV), m. 238-9°, was prep'd. according to the method of Gabriel and Pinkus (*Ber.* 26, 2203(1893)) by warming III with a concd.  $NH_4SCN$ . IV crystd. slowly meanwhile. This suspended in aq.  $FeCl_3$  was warmed 0.5 hr. on the  $H_2O$  bath,  $K_2CO_3$  was then added and  $FeCO_3$  which sep'd. was filtered. The acidified filtrate was evap'd. to dryness. 4(5)-Methyl-5(4)-allylimidazole (V),  $b_{12}$  180-1°, m. 71°. The oxidation of IV with other oxidizing agents as  $K_2S_2O_8$  and  $H_2O_2$  gave low yields. Mel and V were heated for 0.5 hr. on the  $H_2O$  bath. 1,4-Dimethyl-5-allylimidazole and 1,5-dimethyl-4-allylimidazole were liberated by  $K_2CO_3$ , the mixt.  $b_{12}$  125-8°. The HBr salt of V was warmed 5 hrs. at 90-100° with 25% HBr, the mixt. was evap'd. to dryness and the cryst. residue was dissolved in  $H_2O$  made alk. with  $K_2CO_3$ . 4(5)-Methyl-5(4)-β-bromopropylimidazole (VI), m. 109-10°. VI in concd.  $NH_4OH$  after standing 24 hrs. was warmed on the bath and then evap'd. *in vacuo*. The residue was taken up again in  $K_2CO_3$  soln. and  $CHCl_3$  which dissolved the 4(5)-methyl-5(4)-β-aminopropylimidazole,  $b_{10}$  185-6°,  $b_2$  148-9°. The dihydrochloride is hygroscopic and m. 217°. The dipicrate, m. 229-30°. VI when warmed with dry  $Et_3NH$  in abs. alc. gave a mass which with  $K_2CO_3$  gave 4(5)-methyl-5(4)-diethylaminopropylimidazole,  $b_2$  143-4°. The dihydrochloride, m. 199-200°. The dipicrate, m. 178-9°. A suspension of V in  $CS_2$  was treated with Br in  $CS_2$ . The Br disappeared at once, the HBr salt was filtered, washed with  $CS_2$ , dried *in vacuo* and treated in  $H_2O$  with  $K_2CO_3$  giving 4(5)-methyl-5(4)-β,γ-dibromopropylimidazole, m. 116-7°. 4(5)-Methyl-5(4)-β,γ-chloriodiopropylimidazole, m. 94-5°, was prep'd. in a similar manner.

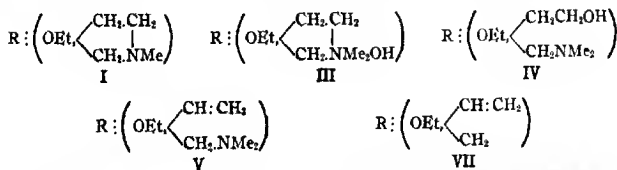
H. E. W.  
**Constitution of ricinine.** ERNST SPÄTH AND GEORG KOLLER. *Ber.* 56B, 880-7 (1923); cf. *C. A.* 16, 1070.—It was shown in the earlier paper that the compds.  $C_8H_7NO_2$  and  $C_8H_7ON$  obtained from ricinine (I) with concd. HCl and  $H_2SO_4$ , resp., are 1-methyl-4-hydroxy- and 1-methyl-4-methoxy-2-pyridone. It has now been found that when the HO group in ricinic acid (II) is replaced by Cl and the Cl is then replaced by H, the resulting ricinidine (III) is decomp'd. by alkalis into  $NH_3$  and 1-methyl-2-pyridone-3-carboxylic acid (IV), which, treated successively with  $SOCl_2$  and  $NH_3$ , yields an amide regenerating III on dehydration. These results show that I is 1-methyl-3-cyano-4-methoxy-2-pyridone,  $CH_3CH(OMe):C(CN).CO.NMe$ . The comp'd.  $C_8H_7ON_2Cl$ , ob-

tained in 3.5 g. yield from 4 g. II heated 6 hrs. at 100° in a sealed tube with 60 cc.  $POCl_3$ , m. 159°, produces sneezing, regenerates II and I when refluxed with Na in MeOH; 1.5 g. in  $EtOH$  with 3 g. of 4% Pd-BaSO<sub>4</sub> and 4.5 g. NaOAc hydrogenated under pressure yields 1.256 g. III,  $b_{12}$  243°, m. 140°, 0.5 g. of which, refluxed 5 hrs. with 2.5 g. Na in 50 cc. MeOH gives 1-methyl-2-pyridone-3-carboxamide (V), m. 216°; 0.095 g. of this on 62 hrs. further refluxing with 2 g. Na in 40 cc. MeOH gives  $NH_3$  and IV, m. 184°. IV is not identical with 2-pyridone-1-acetic acid, m. 220-3°, which was obtained in 0.74 g. yield from 2.3 g. 2-methoxypyridine and 6.97 g.  $ICH_2CO_2Me$  heated 12 hrs. on the  $H_2O$  bath under a reflux, freed from the excess of methoxypyridine with steam, made strongly alk. and allowed to stand 2 hrs. Nor is IV identical with 1-methyl-2-pyridone-6-carboxylic acid, m. 247-8°, which was obtained in 0.1505 g. yield from the di-Ag salt from 1 g. 2-hydroxypyridine-6-carboxylic acid and 8 cc. MeI heated in a sealed tube 48 hrs. at 100° and 12 hrs. at 130°; on heating, it gives 1-methyl-2-pyridone. IV was synthesized by heating di-Ag 2-hydroxypyridine-3-carboxylate with excess of MeI 40 hrs. at 100°, evapg. off the MeI, extg. the residue with hot alc., evapg. the ext., dissolving the residue in a little  $H_2O$ , removing the I with a few drops of aq.  $H_2SO_4$ , making strongly alk. and heating on the  $H_2O$  bath 1 hr.; it was also obtained (in better yield—0.992 g.) from 1 g. 2-hydroxypyridine-3-carboxylic acid and 0.48 g. Na in 20 cc. MeOH evap'd. to dryness *in vacuo*, heated 35 hrs. at 100° with 16 cc. MeI, evap'd. and heated 1 hr. on the

H<sub>2</sub>O bath with 2.7 g. KOH in H<sub>2</sub>O. V was synthesized (yield, 0.425 g.) by heating 0.56 g. IV 1 hr. on the H<sub>2</sub>O bath with 5 cc. SOCl<sub>2</sub> and treating the resulting chloride with excess of concd. aq. NH<sub>4</sub>OH; distd. *in vacuo* with P<sub>2</sub>O<sub>5</sub> it gives III, while 0.037 g. heated 5 hrs. at 100° in a sealed tube with 1 cc. POCl<sub>3</sub> yields 2-chloro-3-cyanopyridine (VI) and 0.014 g. III. 2-Chloropyridine-3-carboxamide (0.736 g. from 1 g. of the acid refluxed 4 hrs. with 2 g. PCl<sub>5</sub> and 25 cc. POCl<sub>3</sub> and then 4 hrs. longer with 2 g. more of PCl<sub>5</sub>, freed from the P chlorides *in vacuo* and allowed to stand some time with concd. NH<sub>4</sub>OH), m. 163–4°; 0.06 g. cautiously heated *in vacuo* with 0.078 g. P<sub>2</sub>O<sub>5</sub> yields VI, m. 103–5° also obtained by heating 0.04 g. III at 150° in a sealed tube with 0.045 g. POCl<sub>3</sub> and 0.42 g. PCl<sub>5</sub> or by heating 0.318 g. of the amide 16 hrs. at 100° in a homh with 15 cc. POCl<sub>3</sub>. The formation of VI from III confirms the view that III is 1-methyl-3-cyano-2-pyridone.

C. A. R.

**Etheserolene.** MAX AND MICHEL POLONOVSKI. *Compt. rend.* 176, 1480–3 (1923).—A previous paper (C. A. 13, 1316) described the decompn. of the Et ester of eserolene by Hofmann's method and the product etheserolene, partly deprived of N. Later work has given all the intermediate compds. pure, more correct values for phys. consts., and identified the N residue and the nucleus. Eserethole (I) (R = C<sub>2</sub>H<sub>5</sub>N) gives with 1 mol. of MeI a methiodide (II), which with excess of NaOH gives a ppt. of the oily quaternary base (III), changing to crystals (IV), dissolving in Et<sub>2</sub>O very slowly after transformation, the heterocyclic hydrogenated nucleus opening to form V. The base eseretholemethine, m. 89°; the orange-red picrate, m. 196°. The methine with MeI and Et<sub>2</sub>O gives after several days a deposit neutral to litmus, m. about 105°, contg. two methiodides,  $\alpha$  and  $\beta$ . This treated with Et<sub>2</sub>O-MeOH mixt. gives the  $\alpha$ -form, neutral, m. about 135°,  $\alpha_D$  2°; in the mother liquor remains the  $\beta$ -form,  $\alpha_D$  = –25°. The  $\alpha$ -compd. (VI), with concd. boiling NaOH decomps. into NMe<sub>3</sub> and a new compd., etheserolene (VII), C<sub>14</sub>H<sub>17</sub>NO.H<sub>2</sub>O, easily volatile in steam; the  $\beta$ -form does not decomp. under the same conditions, but with I gives a methiodide of eseretholemethine, C<sub>15</sub>H<sub>18</sub>N<sub>2</sub>.Me(OEt)I.H<sub>2</sub>O. VII, m. 48°,  $\alpha_D$  in alc. at 95°–98°; an aq. alc. soln. with FeCl<sub>3</sub> gives a reddish brown color. It is a very weak base, sol. in moderately concd. acids, pptd. by H<sub>2</sub>O; with excess of MeI alone or in MeOH it gives a cryst. methiodide, m. 179°,  $\alpha_D$  –40° in H<sub>2</sub>O, pptd. without change by NaOH but warmed with concd. NaOH it decomps. quant. into MeOH and the initial base. Thus VII has a tertiary N able to add MeI, like all feeble bases (pyrazoles, indazoles, dehydroindoles whose quaternary salts decomp. to alkyl halide and initial base). NaNO<sub>2</sub> in AcOH gives a NO deriv., m. about 97°. VII warmed gently with HNO<sub>3</sub> in portions, dissolves; at about 50° a reddish yellow compd. m. 215°, is deposited with evolution of abundant nitrous vapors; HNO<sub>3</sub> causes partial oxidation; the exact compn. of the product is not known, but considerable light is thrown upon the nucleus of VII; the nitrated product with cold NaOH gives quant. 1 mol. MeNH<sub>2</sub>, picrate m. 209°; hence the tertiary N is methylated; distn. with 0 pts. of Zn dust in H gives a volatile compd., showing the pine-wood reaction. The tertiary methylated N makes part of a pyrrolic or indolic nucleus. Like eserine and all its derivs. VII is reduced by Zn and HCl to a hydrogenated, oily compd., hydroetheserolene (VIII),  $\alpha_D$  –30°, much less stable than VII, gives with alkalis a red, with acids a green color; with HNO<sub>3</sub> a red oily deriv.; with excess of MeI a pasty methiodide,  $\alpha_D$  –20°, decompd. by hot alkali to VIII. In resumé VII is a weak base whose tertiary N in a pyrrolic nucleus is bound to a Me group, has the double bond of the eserine derivs. and their asym. C. Besides, the red color of its NO<sub>2</sub> and NO derivs. and the behavior of its methiodide resemble the VII of the dehydroindole or of the hydroquinolines. All this limits considerably the possible constitution of this deriv. and of eserine also.



JAMES BROWN

**The alkaloids of *Corydalis cava*.** ERNST SPÄTH, ERICH MOSEYTTIG AND OTTMAR TROTHANDL. *Ber.* 56B, 875–9 (1923).—In working up the alc. exts. of buds of *Corydalis cava* gathered during the fall months in the vicinity of Vienna the amt. of cory-

daline was found to be low and on the other hand 2 new alkaloids were isolated, viz., *d-tetrahydropalmatine* (I) and *corypalmine* (II). The alkaloids of the dry buds (3.5 kg.) were prepd. essentially by Gadamer's method except that the Et<sub>2</sub>O soln. of the alkaloids was shaken out with NaOH to sep. the phenol bases from the completely methoxylated compds.; the latter, allowed to stand some days in HCl, deposited the difficultly sol. HCl salt of I. I, obtained in 15 g. yield, m. 142°, gradually turns yellow (with partial transformation into the dehydro deriv.) in the air (especially at elevated temps.), shows distinct bluish luminescence in the dark when pressed with a glass rod or shaken in a flask,  $[\alpha]_D^{25}$  292.5° (alc.), oxidized by I in alc. at 100° to palmatine iodide. To obtain the phenol bases, the Et<sub>2</sub>O soln. of the free alkaloids, concd. to about 1.5 l., was allowed to stand 2 days, filtered from the cryst. mass which sepd. and which consisted chiefly of bulbocapnine and extd. with KOH; the alk. exts. were acidified, treated with Na<sub>2</sub>CO<sub>3</sub> and allowed to stand some days; the resulting ppt. was sepd. by fractional extn. from CHCl<sub>3</sub> with very dil. HCl into bulbocapnine, corybulbine (III) and 0.15 g. II. That III is a demethylated corydaline was confirmed by converting it with alc. I into its dehydro deriv., methylating with Me<sub>2</sub>SO<sub>4</sub> and reducing to the tetrahydro compd. which proved to be identical with *dl*-corydaline. II, m. 235-6°,  $[\alpha]_D^{18}$  280°, has the compn. C<sub>20</sub>H<sub>27</sub>O<sub>4</sub>N and gives I with ONNMeCO<sub>2</sub>Et; it is therefore a deriv. of I contg. a free phenolic HO group instead of 1 of the MeO groups. C. A. R.

**Strychnine alkaloids. XXXVII. The decomposition of methylacotheline and its violet color reaction with sodium sulfite.** HERMANN LEUCHS, BERNHARD WINKLER AND W. ROBERT LEUCHS. *Ber.* 55B, 3936-50(1922); cf. C. A. 17, 2586.—The violet product obtained from methylacotheline and Na<sub>2</sub>SO<sub>3</sub> (C. A. 13, 718) is of special interest because it is isomeric with the starting material and not formed by the addn. of H<sub>2</sub>. This violet "nitrohydroquinol methyl sulfite" (I) results in 1.6 g. yield from 3 g. methylacotheline (II); the liberated NaOH transforms the rest of II into the methylbetaine, which also gives I if treated with 2 mols. Na<sub>2</sub>SO<sub>3</sub>. In the case of the nitrate and chloride, prolonged boiling in the presence of the air is necessary for the formation of I. *Et ester*, by satn. of an EtOH suspension of I with dry HCl, dark violet prisms, the alk. sol. of which quickly changes to yellow in the air. *Anhydride*, moss-like orange needles, by heating I with Ac<sub>2</sub>O and AcONa at 100° 1 hr.; FeCl<sub>3</sub> in EtOH gives a green color while alkalies give violet solns. *Diacetate of anhydride*, yellow. Me<sub>2</sub>SO<sub>4</sub> reacts with I to give a *Me deriv.*, C<sub>22</sub>H<sub>27</sub>O<sub>14</sub>N<sub>2</sub>S, dark violet, giving a violet, then brown soln. in alkali. If the violet nitrate is heated with Na<sub>2</sub>SO<sub>3</sub> and SO<sub>2</sub> in H<sub>2</sub>O in a tube at 100°, there result reddish prisms of the compd. C<sub>22</sub>H<sub>27</sub>O<sub>11</sub>N<sub>2</sub>S<sub>2</sub>, which give a deep blue soln. with FeCl<sub>3</sub>, and a red, then blue soln. with alkalies; a 2nd product is the compd. C<sub>22</sub>H<sub>27</sub>O<sub>9</sub>N<sub>2</sub>S, crystg. with 1 H<sub>2</sub>O, which gives a red soln. in cold alkali, changing to pale blue and, upon heating, to dark blue, green and finally pale yellow. Oxidation of I by the air (1-2 hrs. in NH<sub>4</sub>OH soln.) gives the compd. C<sub>22</sub>H<sub>27</sub>O<sub>11</sub>N<sub>2</sub>S<sub>2</sub> with 2H<sub>2</sub>O of crystn. (III), which may be reduced to I by heating with satd. H<sub>2</sub>SO<sub>4</sub>. Reduction of III with Sn and 12 N HCl gave the compd. C<sub>22</sub>H<sub>27</sub>O<sub>7</sub>N<sub>2</sub>S.HCl.4H<sub>2</sub>O, which reduces AgNO<sub>3</sub>, and gives a red soln. in alkalies, changing to dark blue, violet and finally yellow. It was also obtained by reducing I in the same way. *Sulfate, nitrate and hydrobromide* were also prepd. A 2nd product of the reduction was the compd. C<sub>22</sub>H<sub>27</sub>O<sub>9</sub>N<sub>2</sub>S.HCl.2H<sub>2</sub>O, which is sepd. by its greater insoly. III, treated with EtOH-H<sub>2</sub>SO<sub>4</sub>, gives a *di-Me deriv.*, greenish prisms; a yellow *mono-Me deriv.* was also prepd. The *di-Et deriv.* forms brownish rectangular prisms, while the *mono-Et deriv.* forms nearly colorless prisms. Oxidation of II by Br in HBr gave the compd. C<sub>20</sub>H<sub>25</sub>O<sub>2</sub>N<sub>2</sub>Br, rectangular prisms or leaflets,  $[\alpha]_D^{18}$  -6.75° (in H<sub>2</sub>O); *nitrate*, needles and prisms,  $[\alpha]_D^{18}$  -7.4°. If SO<sub>2</sub> is passed into the filtrate from the above bromide, the compd. C<sub>18</sub>H<sub>23</sub>O<sub>2</sub>N<sub>2</sub>Br, seps. with 1 mol. H<sub>2</sub>O, and shows  $[\alpha]_D^{18}$  -4.3° in H<sub>2</sub>O. *Me ester* of "nitrophenol-methylbetaine," C<sub>22</sub>H<sub>27</sub>O<sub>9</sub>N<sub>2</sub>, by heating the Me ester of the oxime of acotheline-MeCl with MeOH-NH<sub>3</sub> in a tube at 100° for 2 hrs., apple-green prisms C. J. WEST

Propionic acid and ketones from whey (WHITTIER, SHERMAN) 16. Dehydrating alcohol and certain organic liquids (GUINOT) 13. Decomposition of *cis*- and *trans*-isomeric unsaturated acids by molds (VERKABE, SÖHNGEN) 11C.

KLEIN, JOSEF. *Chemie II. Organischer Tell.* 5th Revised ed. Berlin and Leipzig: W. de Gruyter & Co. 187 pp.

LIALIN, L. *Chemical Technology of Organic Compounds.* (In Russian.) Petrograd: Naucnoje chimiko-techniceskoje Izdat. 97 pp.

MEYER, HANS. *Analyse und Konstitutionsermittlung organischer Verbindungen*. 4th Revised ed. Berlin: Julius Springer. 1191 pp.

RICHTER, VIKTOR V. *Chemie der Kohlenstoffverbindungen oder organischen Chemie*. II. 11th ed. revised by R. Anschütz and G. Schroeter. Bonn: F. Cohen.

**Sulfonating benzene.** P. A. BARRETT. U. S. 1,459,081, June 19. In continuous sulfonation of  $C_6H_6$  (which may be impure), the vaporized  $C_6H_6$  and heated concd.  $H_2SO_4$  are continuously supplied to the reaction app. (which may be in the form of a rectifying column) and the benzenesulfonic acid formed is continuously removed.

**Camphoric acid.** W. T. SCHEELER. U. S. 1,458,992, June 19. In manuf. of camphoric acid, pinene is treated with  $Na_2O_2$  (in abs. alc. at 60–80° for 2 hrs.) or other alkali peroxide and the resulting product is treated with  $H_2O$ .

**Camphor.** W. T. SCHEELER. U. S. 1,458,993, June 19. Camphoric acid is reduced to camphor by the action of a finely divided readily oxidizable metal such as finely divided Fe.

**Dehydrating alcohol with glycerol.** J. VAN RUYMBEKE. U. S. 1,459,699, June 19. See Brit. 184,036 (C. A. 17, 770).

## 11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

**The reaction between proteins and nitrous acid.** The tyrosine content of deaminized casein. H. B. LEWIS AND HELEN UPDEGRAFF. *J. Biol. Chem.* 56, 405–14 (1923).—If the deamination of casein is carried out at low temps., tyrosine, as detd. by the method of Folin and Looney, (C. A. 16, 1790) is not destroyed. This destruction occurs at higher temps., as a secondary reaction.

**A product of mild acid hydrolysis of wheat gliadin.** H. B. VICKERY. *J. Biol. Chem.* 56, 415–28 (1923).—The ppt. obtained by the treatment of gliadin with 0.3 N HCl in 70% HCl at 90° for 6.5 hrs. was isolated and analyzed by Van Slyke's method. The N distribution was 4.55% amide, 0.52% humin absorbed by  $Ca(OH)_2$ , 0.17%bumin absorbed in amyl alc. ext., 1.35% cystine, 9.34% arginine, 3.99% histidine, 2.75% lysine, 67.72% amino-N and 8.83% non-amino N in the filtrate from bases. This is not the compn. calcd., for a gliadin changed by removal of amide groups, indicating that some peptide links had been broken by the previous very mild acid treatment.

**Studies on the digestibility of proteins in vitro.** IV. The digestibility of the cottonseed globulin and the effect of gossypol upon the peptic-tryptic digestion of proteins. D. BRESSE JONES AND H. C. WATERMAN. *J. Biol. Chem.* 56, 501–11 (1923); cf. C. A. 16, 2713.—"Pepsin and trypsin, acting successfully *in vitro*, digest casein and the globulin of the cottonseed to very nearly the same extent and at practically the same rate through an extended period. The addition to the protein of 1% of its wt. of the toxic principle, gossypol, known to be present in cottonseed kernels to the extent of from 1.5 to somewhat more than 5% of the estimated ( $N \times 6.25$ ) protein content, interferes markedly with the digestion *in vitro* of the cottonseed globulin by pepsin and trypsin, and by pepsin alone, as well as the digestion of casein by pepsin and trypsin. The incomplete digestion (83%) by animals of the protein content of cottonseed press-cake preparations is tentatively explained as an inhibitive effect of gossypol."

**Glucokinin, a new hormone present in plant tissue.** Preliminary paper. J. B. COLLIP. *J. Biol. Chem.* 56, 513–43 (1923).—Subcutaneous injection of the exts. prepd. from the vegetative tissues of several angiospermous plants as well as yeast produced marked hypoglycemia in normal rabbits. Some of these exts. were administered to depancreatized dogs and caused an increase in the rate of sugar excretion of short duration, followed by a much longer period of decreased elimination and low level of blood sugar. The action of these exts. differs from that of insulin in that it develops more slowly and is more continued.

**Absorption of aniline dyes by the protoplasm and cell wall.** ALFRED DORNER. *Centr. Bakl. Parasitenk., II Abt.* 56, 27–31 (1921).—This is a short review of the theories on the vital staining of cells with aniline dyes.

**The oligodynamic action of metallic copper on blood catalase.** M. HANDEL AND

E. SEGALL. *Z. Hyg.* 97, 1-11(1922).—Blood catalase is injured by metallic Cu while the spontaneous decompn. of  $H_2O_2$  is not interfered with. The injurious action of Cu on catalase is stronger in the light than in the dark and in NaCl soln. than  $H_2O$ .  $H_2O$  and glass vessels that have been in contact with Cu act as the Cu itself. The action of Cu on catalase has the characteristics of the so-called oligodynamic action. The action of catalase on  $H_2O_2$  and of Cu on catalase follow the laws of monomol. reaction. The action of Cu is the result of its soln. and not of a special energy. J. H. L.

The living peritoneum as a dialyzing membrane. T. J. PUTNAM. *Am. J. Physiol.* 63, 548-65(1923).—Various fluids were introduced into the peritoneal cavity of anesthetized animals and changes in vol. and concn. detd., together with simultaneous changes in the blood. The dialysates obtained in the body cavity contain traces of protein and various crystalloids occurring naturally in blood plasma or artificially introduced into the circulation. Under certain conditions fluids in the peritoneal cavity can come into an apparently complete osmotic equil. with the blood plasma. The speed of diffusion of different mols. through the peritoneum appears to vary inversely with their resp. sizes. Colloids in general are not transmitted from the blood stream into fluids in the peritoneal cavity; they may be absorbed, however, although not as rapidly as crystalloids. Changes in vol. of hypo- and hypertonic solns. in the peritoneal cavity occur in the direction which might be predicted from a consideration of the osmotic forces at work, but never to exactly the extent demanded by the laws of osmosis. Absorption into the blood stream is always greater than the expected diffusion from the peritoneal cavity, and sometimes very much greater. Conclusion: While the major part of the transfer of crystalloid to and from the peritoneal cavity may be explained as being due to a simple colloidal membrane, the presence of another pathway, capable of transmitting colloids and particles as well as true solns., and oriented only away from the peritoneal sac, must be predicted. J. F. LYMAN

Blood clotting in mammals, birds and reptiles. S. E. DORST AND C. A. MILLS. *Am. J. Physiol.* 64, 160-6(1923).—The active tissue coagulant (C. A. 15, 2304) of all animal tissues studied is composed of a phospholipin and a protein fraction, the former exhibiting slight thromboplastic activity, while the latter acts always as a strong anticoagulant for all bloods. There is little or no specificity in the phospholipin action or in that of the anticoagulant blood. While there is some difference in the action of tissue expts. on the clotting of homologous and heterologous bloods, so far as speed of the coagulation is concerned, there is no difference as regards the ability of the coagulant to enter into union with the blood fibrinogen to form fibrin. J. F. LYMAN

Colloid chemistry of protoplasm. I. General considerations. II. The electrical charges of protoplasm. L. V. HEILBRUNN. *Am. J. Physiol.* 64, 481-98(1923).—The effect of  $CaCl_2$ ,  $MgCl_2$ ,  $NaCl$ ,  $KCl$ , and  $NH_4Cl$  on the viscosity of sea-urchin egg protoplasm was studied by the following method: The eggs were treated with sea-water + the particular salt soln. being tested, the concn. of the latter being approx. isotonic with sea-water. The eggs were then centrifuged and the effect on the viscosity of the internal protoplasm was judged by the extent and rate at which the granules within the protoplasm separated at the top (lipoids) or bottom (proteins, etc.) of the egg cells.  $CaCl_2$  and  $MgCl_2$  tend to liquefy the protoplasm of sea urchin eggs, while  $NaCl$ ,  $KCl$  and  $NH_4Cl$  tend to increase its viscosity. The effects of the salts on viscosity are the reverse of the order of adsorption of the cations by egg albumin, i. e., the cations (Ca and Mg) most adsorbed by proteins decrease viscosity (are anticoagulant in effect) while those less adsorbed (K, Na and  $NH_4$ ) increase viscosity. This fact is interpreted as showing that the colloids in the interior of the eggs are positively charged, a further increase in positive charge due to adsorption of cations causing decreased viscosity. The effects of various chlorides on the swelling of the vitelline membrane of sea urchin eggs leads H. to conclude that the exterior layer of protoplasm is negatively charged. J. F. LYMAN

The simultaneous oxidase and peroxidase behavior of copper salts. A. VALDIGUIÉ. *Compt. rend. soc. biol.* 88, 1091-2(1923).—Copper salts may act both as oxidases and as peroxidases with the proper reagents but the presence of air is essential for the reaction, these salts unlike U salts not being able to utilize the O from water. S. MORGULIS

The differentiation of so-called ultramicroscopic structures in the dark field. W. GRAMSS. *Arch. Reichsgesundh.* 53, 848-62(1923).—Ultramicroscopic organisms (filterable viruses, etc.) could not be differentiated from particles of inorganic colloidal solns. The use of the usual biol. stains offered no advantage in this direction. The need of specific micro-reagents is suggested. W. A. PERLZWEIG

The role of oxidizing enzymes in the mechanism of thermogenesis and of fever. G. MARINESCO. *Presse med.* 31, 153-6(1923).—In studying the oxidase content of

the various tissue cells of cold-blooded animals, mammals and birds M. finds that with increasing body temp. as well as with increasing heat production the oxidase content increased. In fever the number of oxidase-bearing cells in the liver is particularly increased. The tissue of cold-blooded animals (frog livers) showed an almost complete absence of oxidases.

W. A. PERLZWEIG

A periodicity of the atomic weights of the principal elements constituting the higher organisms. CASIMIR STRZYZOWSKI. *Presse med.* 31, 156-7(1923).—A rather phantastic attempt at a numerical coordination of 8 of 12 important elements composing the living organism. The formula evolved is:

$$\begin{array}{rcl}
 14 \text{ (N)} + 9 & \nearrow & 23 \text{ (Na)} + 8 & \nearrow & 31 \text{ (P)} + 8 & \nearrow & 39 \text{ (K)} \\
 16 \text{ (O)} + 7 & \nearrow & & \nearrow & & \nearrow & \\
 & + & 8 = 24 \text{ (Mg)} & + & 7 & + & 7 \\
 & & & + & 8 = 32 \text{ (S)} & + & 8 = 40 \text{ (Ca)} \\
 30 + 16(+1) = 47 & & + 16 = 63 & & + 16 = 79
 \end{array}$$

It is to be noted that H, C, Cl and Fe do not fit into this scheme. The original also contains further numerical speculations concerning the 8 elements and organic evolution.

W. A. PERLZWEIG

Occurrence of iodine in nature. TH. VON FELLEBERG. *Mitt. Lebensm. Hyg.* 14, 161-240(1923).—F. gives a historical sketch of the studies upon I from the work of Chatin (cf. *Compt. rend.* 30-39, 46, 50, 82(1850-1876) to the isolation of thyroxin by Kendall (cf. *C. A.* 14, 407). The relations between the amt. of I in drinking water and the prevalence of goiter and of cretinism are discussed. The results of the quant. detns. made in the course of this study are shown in 35 tables. Improved analytical methods of Eggenberger and of Winkler were used in the detn. of I in iodized salts, and a colorimetric method was employed for the detn. of I when present in minute amts. The delicacy of the latter method was greatly increased so that 1 ten-millionth of a g. of I could be recognized, and a detn. made in as little as 0.02 cc. of an I soln. Three new pieces of app. were designed in the course of this study, viz., *Cl generator, centrifuge-microcolorimeter and centrifuge-separatory funnel*. Organically combined I was sepd. from inorg. by evap. a water ext. to dryness and repeatedly rubbing the residue with 90% alc., which removes the inorg. fraction. Special analytical methods are given for the detn. of I in natural waters, natural salts not iodized, vegetable tissue, animal tissue, fats and oils, air at various heights, coal, ash, soot, and many kinds of food. The I content of Swiss waters, salts and foods is given special study. L. W. RIGGS

The production of oxygen from carbon dioxide by protein-chlorophyll solutions. M. EISLER AND L. PORTHEIM. *Biochem. Z.* 135, 293-8(1923); cf. *C. A.* 16, 4252.—The protein-chlorophyll soln. was prepd. by treating an alc. ext. of grass with 4 vols. of dil. (1:20) horse serum. The ppt. was dissolved in carbonate soln. (85 parts 0.1 M NaHCO<sub>3</sub> to 15 parts 0.1 M Na<sub>2</sub>CO<sub>3</sub>), or in 0.85% NaCl through which expired air was blown. When 10 cc. of either soln. was put into a glass container connected with the manometer of a Haldane differential blood-gas app., the level slowly descended on exposure to light and was stationary in the dark. Analysis of the air in such tubes after prolonged exposure to light showed an increase in O over that of a control kept in the dark. Thus, assimilation is shown by solns. free of chloroplasts.

GEORGE ERIC SIMPSON

Light absorption by hematoporphyrin. KIKO GOTO. *Biochem. Z.* 135, 329-43 (1923); cf. *C. A.* 14, 2646.—Ald. solns. of hematoporphyrin, with or without the addn. of NH<sub>4</sub>OH or HOAc, show almost identical curves for sp. extinction coeff. (*e*) plotted against wave length. Maxima occur at 619.2, 566.1, 530.5, and 479.3  $\mu$ . Exposure to light causes lines 1 and 4 to disappear; 1 and 3 arc deepened and shifted slightly. HCl produces a curve with 2 maxima; *e* at these maxima varies with the concn. of acid. Therefore, a mol. change has been produced, the speed of which is proportional to the acid concn. Exposure to light does not affect this curve. Quotients for *e* at different points in the spectrum are calcd.

GEORGE ERIC SIMPSON

Light absorption by hematoporphyrin. PAUL HARI. *Biochem. Z.* 135, 344-52 (1923); cf. preceding abstract.—Hematoporphyrin prepd. from a pathol. urine shows maxima in agreement with those of Goto in ammoniacal alc. soln. In acid-alc. soln., however, the maxima are at 559 and 526. Thus the substance isolated is not identical with the hematoporphyrin of Goto, although closely related to it. G. E. S.

The mode of action of formaldehyde on organ colloids. II. Formaldehyde and protein partition. H. KÖRTEN. *Biochem. Z.* 135, 536-45(1923); cf. *C. A.* 17, 1503.—

Serum globulin flocculates more readily with HCHO than serum albumin. Heating 2 hrs. at 60° increases the globulin fraction of serum protein and causes a proportional increase in viscosity. The increase in viscosity produced by adding HCHO to the sera is greater in previously heated sera than in unheated sera, and the difference in viscosity is proportional to the increased amt. of globulin which results from the heating. Thus, flocculation by HCHO would occur not only in syphilitic blood, but in any blood in which, for any reason, an increase in the globulin fraction had occurred.

GEORGE ERIC SIMPSON

The splitting of starches by a system: neutral salts + amino acids + peptone. HUGO HAEHN. *Biochem. Z.* 135, 587-602(1923); cf. *C. A.* 17, 2653.—A neutral salt soln. (contg.  $\text{CaCl}_2$  +  $\text{NaCl}$  +  $\text{KCl}$ ) in 0.05% starch soln. hydrolyzes the starch in about 24 hrs. Addn. of leucine + alanine hastens this hydrolysis; the further addn. of albumose or peptone provides the optimum soln. for the hydrolysis. These expts. point to a purely chem. hydrolysis, without the aid of living matter. The catalytic effect is slight compared to that of enzymes. Possibly this is an amylase model in its simplest form.

GEORGE ERIC SIMPSON

Individually distinct material and biochemical individual specificity. L. LÖNNER. *Arch. ges. Physiol.* (Pflüger's) 198, 490-503(1923).—The differences observed among individuals of a given race can be referred to differences in the biochem. properties of the peculiar and distinctive materials which comprise the individual. Examples of such principles are provided by the quant. and qual. differences observed in the circulating tissue fluids, in secretions and excretions, in immunity and tolerance phenomena, and in the conditions observed in auto- and homoplastic tissue transplantation.

G. H. S.

Biological significance of hydrogen acceptors. HANS WINTERSTEIN. *Arch. ges. Physiol.* (Pflüger's) 198, 504-12(1923).—As regards reflex irritability, heart activity, or the functioning of nerve centers O cannot be replaced by other H acceptors. The supposed substituting property of *m*-dinitrobenzene is probably referable to certain sp. stimulating effects.

G. H. S.

Permeability changes in red blood cells in solutions of nonconductors. R. HÖBER AND A. MEMMSHEIMER. *Arch. ges. Physiol.* (Pflüger's) 198, 564-70(1923).—Red blood cells washed in isotonic cane sugar soln. absorb less of the vital staining basic dyes than do cells washed in saline. Glycocoll acts like cane sugar in this respect.

G. H. S.

Specificity of enzymes. R. WILLSTÄTTER AND R. KUHN. I. Theory of time value quotients. R. KUHN. *Z. physiol. Chem.* 126, 1-27(1923).—A mathematical discussion; no new data are given. II. Saccharase and raffinase actions of invertin. R. KUHN. *Ibid* 28-92.—The affinity of yeast invertin for sucrose is independent of the purity of the enzyme prepn. and of the  $\text{H}^+$  concn. The latter det. the rate of decomn. of the sucrose-invertin complex. The varying activities of some invertin preps. from different yeasts is attributed to the presence of substances constitutionally related to invertin. The opinion previously held by W. and K. that raffinase and invertin are different enzymes (*C. A.* 16, 2154) is abandoned; it is recognized that both actions may be due to the same enzyme.

R. L. STEHLE

Pancreatic enzymes. I. Determination of pancreatic fat hydrolysis. R. WILLSTÄTTER, E. WALDSCHMIDT-LEITZ AND FRIEDRICH MEMMEN. *Z. physiol. Chem.* 126, 93-131(1923).—The method adopted for future studies consists of detg. the extent of hydrolysis when 2.5 g. olive oil are treated with 13 cc. of enzyme soln. contg. 0.2 cc. of a buffer mixt. ( $\text{NH}_2\text{-NH}_4\text{Cl}$ ) of  $p_{\text{H}}$  8.9 for 1 hr. at 30°. The acid liberated is titrated in alc. soln. with 0.1 *N* KOH, with thymolphthalein as indicator. The lipase unit is taken as the quantity which produces 24% hydrolysis under the conditions given; the lipase value is the no. of units in 1 cg. of substance. The activating effects of  $\text{CaCl}_2$ , Na glycocholate, egg white and glycerol and the deterioration and inhibition of deterioration of preps. by absorbers were detd. The lipase unit may also be detd. by conducting the hydrolysis in acid soln. ( $p_{\text{H}}$  = 4.7) but in this case it reaches only 2.25%. Up to 10% the rate of hydrolysis in acid soln. is proportional to the enzyme concn. II. Pancreatic lipase. R. WILLSTÄTTER AND E. WALDSCHMIDT-LEITZ. *Ibid* 132-98.—Lipase preps. were freed from amylase and trypsin by 2 adsorptions with  $\text{Al}(\text{OH})_3$ . Kaolin, tristearin and cholesterol also adsorb the enzyme; successive adsorptions with  $\text{Al}(\text{OH})_3$ , kaolin and tristearin produced the most concd. preps. R. L. STEHLE

Quantities of tryptophan in various proteins. YOSHIHIKO MATSUYAMA AND TAKAJIRO MORI. *J. Chem. Soc. Japan* 44, 377-81(1923).—By May's and Rose's method (*C. A.* 17, 116), and M. and T.'s modification (previous treatment with alkali to prevent pptn. of protein which is colored if M.'s and R.'s method is used as such), the tryptophan

contents of various proteins are reported. The results from M. and R.'s method, and M.'s and T.'s modification are, resp.: beef protein 1.20, 1.28; swellfish protein 1.38, 1.38; tunny fish protein 1.18, 1.01; salmon protein 1.03, 0.92; scallop protein 1.18, 1.09; serum albumin 1.62, 1.45; fibrin 1.71, —; hemoglobin 1.71, —; egg albumin 1.18, 1.11; fibrin trace, trace; mucin 0, 0; gelatin 0, 0; globulin 1.62, 1.52; soy bean protein 0.83, —; rice protein 1.33, —; corn protein trace, —; edestin 1.46, 1.40; legumin 0.94, 0.67; conglutin 1.45, 1.28; wheat gluten 1.00, 0.95; zein 0, 0, buckwheat protein 0.68, 0.83; and syntonin 0.63, 0.82%.

**Action of soy urease. I. Influence of glyocoll on the action of soy urease.** NAOSABURO KATO. *J. Pharm. Soc. Japan* No. 488, 867-93 (1922).—In order to investigate the mechanism by which glyocoll favors soy urease action, K. prepd. 3 different urease samples and studied their action under various conditions. Sample 1 is the one said to have been prepd. in 1921 by Shimidzu according to Jacoby and Sugga's method. Sample 2 was prepd. by K. in 1921 from the same soy bean used in Sample 1. Sample 3 was similarly prepd. by K. in 1922. The general methods of expts. are those of J. and Umeda.  $\text{NH}_3$  was titrated with laemoid and malachite green as indicator. No huffer was used during fermentation. With a const. amt. of urea (400 mg. in 31 cc.), urease action (Sample 3) varies with the amt. of urease used; there is a sharp reflection of the curve at 18 mg. urease. Sample 1 is more powerful if used from 2 to 23 mg.; from 23 to 30 mg., sample 2 is more powerful, the former having reflection point at 13 mg. while the latter at 27 mg. Two hypotheses are offered: (1) Soy-bean urease consists of 2 substances, urease and co-urease. (2) Urease action consists of (a) union of urease-urea, (b) action of co-urease on urea-urease, in which urease is freed and co-urease-urea is formed and (c) decompn. of co-urease-urea to co-urease,  $\text{CO}_2$  and  $\text{NH}_3$ . Thus at reflection points different samples must contain equiv. amts. of co-ureases. The effects of 10 and of 20 mg. of glyocoll with various concn. of the enzyme were studied. With 10 mg. the effect is to increase the reaction up to 18 mg. urease, and above that the curve is the same as for the control. With 100 mg. the reaction is generally increased for all concns. of the enzyme. From various other expts. a conclusion is drawn that glyocoll acts similarly to co-urease. Effects of  $\text{Ca}_3(\text{PO}_4)_2$  and metallic Zn are also studied. Zn is poisonous to co-urease. The detailed results are given in 13 tables and 7 curves. **II.** *Ibid* 494, 228-47 (1923).—Expts. were conducted in the presence of a phosphate huffer ( $p_H = 7.0$ , when mixed with urea and glyocoll). For a const. urease concn. there is an optimum urea concn., which varies with the different samples. When the urea concn. is smaller than this optimum, an addition of glyocoll does not change the reaction, while at a greater concn. than this optimum, it accelerates. Under these conditions, the more glyocoll is added, the greater is the acceleration resulting up to a certain point, which varies with urea concn. There is definite chem. union between urease and glyocoll. If glyocoll and urease are mixed and used after a definite period, the amt. of  $\text{NH}_3$  given off is different from the case when urease and glyocoll are used immediately after the mixing. The effect of glyocoll is more pronounced at the later state of fermentation than at the beginning. The soy urease contains a glyocoll-like substance which accelerates urease reaction. If old urease soln., which has almost no urease activity, is added to a fresh urease soln. the reaction is tremendously accelerated. It is now believed that co-urease unites with urea first, that this compd. is decomposed by urease, and that excess urea if combined with urease does not decompose into  $\text{NH}_3$  and  $\text{CO}_2$ . S. T.

The problem of sight (PLOTNIKOV) 3. Influencing adsorption processes by the presence of colloids in the sol condition (WEYL) 2.

BAYLISS, WM. M.: *Colloidal State in its Medical and Physiological Aspects*. London: Milford. 95 pp. 6s.

FOLKMAR, E. O.: *Studier over nogle Kulhydraters Skaebne i Organismen saerlig undersøgt ved permanent intravenøs Injection*. Kopenhagen: Busck. 188 pp. Kr 8.

LAZAREV, P.: *Ionentheorie der Reizung*. Bern and Leipzig: E. Bircher. 52 pp.

WALKER, FLORENCE: *Influence of Certain Amino Acids upon the Enzymic Hydrolysis of Starch*. Troy, N. Y.: Florence Walker. 18 pp. \$0.50.

## B—METHODS AND APPARATUS

STANLEY R. BENEDICT

**Errors in the determination of dextrose in the urine by fermentation.** CARL LANGE. *Berl. klin. Wochschr.* 58, 957-9 (1921).—Small amts. of salts of  $\text{HNO}_2$  and  $\text{HNO}_3$  that occur in the urine react with urea, amino acids and  $\text{NH}_3$  to liberate N. The acids formed



during fermentation react with the carbonates of the urine to form  $\text{CO}_2$ . Impure preps. of yeast spontaneously liberate gas either from fermentation of glycogen or from bacterial growth. These sources of gas make the detn. of dextrose in the urine very uncertain. Several controls are needed, which make the test inapplicable to clinical use.

JULIAN H. LEWIS

A method for the detection of phenols produced by bacteria. WILLIAM H. BELL. *J. Infectious Diseases* 29, 424-8(1921).—The acidified fluid medium is subjected to steam distn. The presence of phenols in the distillate is indicated by the production of a red color when diazotized *p*-nitroaniline in an alk. soln. is added. This method will show on blank detns. a distinct yellowish red color with phenol dild. 1:1,000,000. In culture mediums it is easily possible to show the presence of phenol in the concn. of 1:500,000.

JULIAN H. LEWIS

The differentiation of living and dead protoplasm by methyl green. FELIX HAUROWITZ. *Arch. path. anal.* (Virchow's) 242, 345-9(1923).—The violet stain taken by living cells with methyl green is the result of contamination of the stain with methyl violet. Demethylation of methyl green does not occur. The refractory behavior of living cells to methyl green depends on the lipid-insol. of the stain, which prevents its penetrating the intact, lipid-rich membrane of the living cell. Methyl violet penetrates. The post-mortem acidity of cells also plays a role in the staining of dead cells through its conversion of the colorless base into the colored acid dye. E. R. LONG

The picramic acid methods for blood sugar. H. C. SWERNY AND ETHEL M. JOHNSON. *J. Lab. Clin. Med.* 8, 506-13(1923).—There are serious discrepancies between the picramic acid methods and the Cu reduction methods. These are not marked in normal subjects, but may be great in diseased subjects, particularly in nephritis. In the majority of patients with nephritis there is a great augmentation of results by the picramic acid methods. The presence of phenol or  $\text{PhKSO}_4$  in blood produces a false sugar result by the picramic acid method. This method may be used to det. the presence in blood of "reducing substances other than glucose." E. R. LONG

The preservation of natural colors in gross specimens. OSKAR KLOTZ. *J. Lab. Clin. Med.* 8, 514-7(1923).—Use isotonic salt soln. as the basis for the fixing fluid for tissues, and add alkali to neutralize the acidity developing post-mortem. A suitable fluid is  $\text{NaCl}$  8.5 g.,  $\text{NaHCO}_3$  5.0 g., formalin 30-50 cc., water 1000 cc. Add 40 g. chloral hydrate for the preservation of natural colors, or hubble CO or illuminating gas through the fluid for 15-20 min. each day for 5-7 days after the tissues have been fixed in it. Use 5 times the vol. of the tissue to be fixed. Mount in an air-tight jar.

E. R. LONG

Clinical and laboratory procedures in pediatrics. A. LEVINSON. *J. Lab. Clin. Med.* 8, 525-37, 579-88(1923).—An outline of easily applied methods of chemical analysis of blood. E. R. LONG

A simple method for computation of metabolic determinations by the use of the slide rule. M. W. HOLLINGSWORTH. *J. Lab. Clin. Med.* 8, 538-41(1923). E. R. L.

Mixture of air in the lungs with various gases. I. CHRISTEN LUNDSGAARD AND KNUD SCHIERBECK. *Am. J. Physiol.* 64, 210-30(1923).—Expts. in which the subject rebreathed gas mixts. ( $\text{O}_2$  or  $\text{H}_2$  and  $\text{O}_2$ ) from a rubber bag of 5 l. capacity show that it is possible to produce a complete mixt. between air in the lungs and the gases in the bag and that such a mixt. is obtained after 2 to 5 deep respirations. By drawing several samples of gas from the bag and from the alveolar air, during a mixing expt., the mixing mechanism was investigated. Several factors, though irrelevant as far as mixing is concerned, may produce effects which give the impression that complete mixt. is either impossible or difficult. No differences in the mixing rates of  $\text{O}_2$  and  $\text{H}_2$  were noted. II. The quantitative influence of certain factors in producing a full mixture of hydrogen with air in the lungs. *Ibid* 231-43.—The three main factors concerned in the production of complete mixt. of the air in the lungs with a  $\text{H}_2$ - $\text{O}_2$  mixt. rebreathed from a rubber bag were studied. These factors are: (1) the amt. of air in the lungs after expiration, (2) the depth of rebreathing, and (3) the number of rebreathings. The results have valuable application to those methods in which a complete mixt. of lung air with some other gas is a necessary condition. The results cannot be summarized briefly.

J. F. LYMAN

Calibration of the reversion spectroscope for the estimation of carbon monoxide in blood. H. HARTBRIDGE. *J. Physiol.* 57, 47-51(1922).—The method of calibrating the instrument previously described (*C. A.* 6, 2090) is modified. J. F. LYMAN

The measurement of the tension of oxygen and carbon dioxide in the blood of the pulmonary artery in man. A. C. REDFIELD, A. V. BOCK AND J. C. MRAKINS. *J. Physiol.* 57, 76-81(1922).—The purpose is to est.  $\text{O}_2$  and  $\text{CO}_2$  tensions in the blood of

the pulmonary artery in order to calc. the vol. of blood expelled by the heart in unit time by the method of Fick. The principle involved is that the partial pressure of any gas taken into the alveoli of the lungs will tend to come into equil. with the tension of that gas in the blood which is entering the lung from the pulmonary artery, and this will be true of each gas present. The method is: The subject, who has been sitting at rest for 15 mins. or more, puts on a nose clip; empties his lungs as completely as he can, takes a deep rapid inspiration from a rubber bag of 5 l. capacity provided with a neck of rubber tubing 8 in. long and 0.75 in. bore and provided with 2 side tubes for sampling. He then exhales it rapidly into the bag; inspires deeply again and holds the inspiration for a sec., then empties his lungs to mid capacity into the bag. As this is accomplished the observer collects a sample of the air in the neck of the bottle, which is the last portion expired. The remainder of the gas is held in the lungs 5 or 10 sec. longer, when an exhalation as deep as possible forces it into the bag and again a sample is taken. This procedure is carried out (1) with  $N_2$  in the bag, (2) with a mixt. contg. about 5%  $O_2$  and (3) with a mixt. contg. 6 or 8% of  $CO_2$ . The data are plotted graphically, the  $O_2$  pressure being laid off on the abscissa and the  $CO_2$  pressure on the ordinate. Straight lines are drawn through the 3 pairs of points representing tensions of the gas before and after being held in the lungs for 5 or 10 sec. These lines should meet at a point representing the tension of  $O_2$  and  $CO_2$  in the blood.

J. F. LYMAN

**Determination of urea in the blood.** RENÉ MONIMART. *Bull. sci. pharmacol.* 30, 23-8(1923).—A method employing NaBrO is recommended. L. W. RIGGS

**Mineralization of histologic sections by calcination and its interest as a general histochemical method.** A. POLICARD. *Compt. rend.* 176, 1012-4(1923).—Sections on slides are prepd. by freezing or with paraffin and carefully dried, then the slides are placed in a small electric furnace and are heated to dull redness for about 12 min. The mineral portions are left on the slide in their natural positions with reference to the other tissue elements. If the temp. is raised so as to soften the glass the ash sinks into the slide forming an indelible record of the mineral elements of the section. L. W. R.

**Histochemical detection of total iron in tissues by the method of incineration.** A. POLICARD. *Compt. rend.* 176, 1187-9(1923).—In sections prepd. and incinerated as previously described (cf. preceding abstract) the Fe appears as yellow or red stains according to its quantity. The mineralized sections are examd. microscopically by reflected light. Fe in amts. as small as 1 in 50,000 can be detected and its relations to the other elements of the section can be observed. L. W. RIGGS

**The microdetermination of blood sugar by means of ferricyanide.** H. C. HAGEDORN AND B. N. JENSEN. *Biochem. Z.* 135, 46-58(1923).—**Principle.**—The protein-free filtrate is boiled with 0.005  $N$   $K_3Fe(CN)_6$ ; the unreduced ferricyanide oxidizes KI, and the I is titrated with thiosulfate. For the pptn. of proteins 0.1  $N$  NaOH and 0.45%  $ZnSO_4$  are used. These are freshly prepd. from stock solns. every 8 days; the former from 2  $N$  NaOH, the latter from 45%  $ZnSO_4$  soln. Place 1 cc. NaOH and 5 cc.  $ZnSO_4$  in a 15 × 150-mm. test-tube. Measure from a capillary pipet 0.1 cc. blood, rinsing twice with the liquid in the test-tube. Heat 3 min. in a boiling  $H_2O$  bath. The clear fluid is filtered from the coagulum by pouring through damp cotton on a 3-4 cm. funnel into a 30 × 90-mm. test-tube. The funnel and filter are washed 3 times with 3 cc.  $H_2O$  each. The following solns. are used in the glucose estn.: A. An aq. soln. contg. 1.65 g.  $K_3Fe(CN)_6$  and 10.6 g. fused  $Na_2CO_3$  per l. This is protected from light. B. 5 g. KI, 10 g.  $ZnSO_4$  and 50 g. NaCl are made up to 200 cc. with  $H_2O$ . A stock soln. is made up KI-free, and the KI is added to portions from time to time. When free I is discernible in this soln., filter through thick filter paper. Small amts. of I are taken care of by the blank detn. C. 3 cc. glacial HOAc to 100 cc. with  $H_2O$ . D. 1 g. sol. starch in 100 cc. of a satd. aq. NaCl soln. E. 0.7 g.  $Na_2S_2O_3$  in 500 cc.  $H_2O$ . This is checked frequently against 0.005  $N$  KIO<sub>3</sub> soln. The KI must not contain free I or Fe, and the  $ZnSO_4$ , NaCl and HOAc must not contain Fe. A mixt. of B and C should give no color with starch, but should give a deep color on adding 0.1 cc. of A. The  $Na_2CO_3$  is recrystd. and fused. The  $K_3Fe(CN)_6$  is recrystd. several times from hot  $H_2O$  in artificial light, and dried at 50°. It must be free from Fe and  $K_4Fe(CN)_6$ . The procedure for glucose estn. follows: To the protein-free filtrate (vol. about 14 cc.) add 2 cc. of A. Heat in a boiling  $H_2O$  bath 15 min. Cool. Add 3 cc. of B, 2 cc. of C, and 2 drops of D. Titrate with E. A table is appended giving mg. glucose (G) in terms of cc. 0.005  $N$   $Na_2S_2O_3$ . Or G may be calcd. from the equation:  $G = 0.1735 K - [0.0050 K / (2.27 - K)]$ , where  $K =$  cc. 0.005  $N$  ferricyanide reduced by the glucose. Reoxidation of the ferrocyanide does not occur on standing several hrs. in air. There is a small amt. of reduction in the absence of glucose so that a blank is always run. The

steps in the detn. are analyzed experimentally. Duplicates check closely. Glucose added to blood (80 mg. to 100 cc.) is recoverable with an error of 1%.

GEORGE ERIC SIMPSON

The applicability of the Zuntz-Geppert apparatus to respiratory experiments with small animals. FR. W. KRZYWANEK. *Biochem. Z.* 135, 506-17(1923).—With minor modifications, the Zuntz-Geppert app. may be employed in the detn. of the resp. exchange in small animals.

GEORGE ERIC SIMPSON

Critique of the deWaard micro-method. KURT BLÜHDORN AND GRETE GRNCK. *Biochem. Z.* 135, 581-4(1923); cf. *C. A.* 14, 1559.—Phosphate, within the limits encountered in normal or pathol. blood, does not interfere with the detn. of Ca. The method may safely be used for clinical purposes.

GEORGE ERIC SIMPSON

Xanthrydrol reaction for the microchemical detection of urea in the kidney. KURT WALTER. *Arch. ges. Physiol.* (Pflüger's) 198, 267-78(1923).—Dixanthylurea crystals were demonstrated in the convoluted tubules as well as in the glomeruli. C. H. S.

A quick and simple way of testing for carbon monoxide in the blood (McLOUD)  
7. Determination of CO in blood and air (SAVERS, et al.) 7.

### C—BACTERIOLOGY

A. K. HALLS

The determination of the reaction of culture media by the colorimetric method. G. ABR. *Rev. hyg.* 45, 1-43(1923).—A general elementary paper, with bibliography of 41 titles.

JACK J. HINMAN, JR.

Bile media for the detection of the colon bacillus in water. "D. R. AND ET. R." *Rev. hyg.* 45, 60-1(1923).—Formulas are given for lactose peptone bile, glucose bile (Gryscz and Péret media) and the MacConkey sodium taurocholate neutral red lactose peptone media. The bile media are recommended on account of the ease with which they may be employed.

JACK J. HINMAN, JR.

Three culture media for your formulary. "D. R." *Rev. hyg.* 45, 337-40(April 1923).—Formulas are given for (1) Martin's bouillon, a peptone meat infusion broth intended for general work, or with special modification for the pneumococcus; (2) L. Martin's liver broth, intended for blood culture work on the typhoid group; (3) Dienert and Guillard's autolyzed yeast water, intended for detection of the *B. coli* in water.

JACK J. HINMAN, JR.

The d'Herelle phenomenon. E. GILDEMEISTER. *Berl. klin. Wochschr.* 58, 1355-8(1921).—A review.

JULIAN H. LEWIS

Decomposition of *cis*- and *trans*-isomeric unsaturated acids by molds. P. E. VERKADE AND N. L. SÖHNGEN. *Centr. Bakt. Parasitenk., II Abt.* 50, 81-7(1920).—In a soln. contg. an excess of undissolved  $\text{CaCO}_3$ , these acids exhibit the same behavior towards *Aspergillus niger* as towards *Penicillium glaucum*. Fumaric, cinnamic, *allo*-cinnamic, aconitic, oleic, and croic acids are assimilated readily, and glutaconic acid slightly, whereas malcic, citroconic, mesaconic, itaconic, phenylitaconic, isocrotonic,  $\beta,\beta$ -dimethylacrylic, angelic, tiglic, undecenoic, elaidic, and brassidic acids are not attacked. Similar results are obtained when the free acids instead of their Ca salts are employed, excepting that with cinnamic acid no development of the two organisms take place. It appears that reactivity or inertness toward mold fungi is inadmissible as a means of distinguishing between *cis* and *trans* isomerides. The behavior of certain of these acids towards the molds is explainable by their solubilities in  $\text{H}_2\text{O}$  and in olive oil, but that of other acids cannot be explained in this way. Assimilability appears to depend principally on the mol. configuration of the compd.

JULIAN H. LEWIS

Formation of soluble starch by molds and the influence of acids. FRIEDRICH BOAS. *Centr. Bakt. Parasitenk., II Abt.* 56, 7-11(1921).—The order in which sol. starch appears in cultures with different sugars is as follows: levulose, sucrose, dextrose, maltose, galactose. Sol. starch is formed after the disappearance of diastase, and this seems to be influenced by the rate of formation of acid. There seems to be a parallelism between the formation of diastase and the appearance of conidia in *Aspergillus niger*. With *Aspergillus oryzae* maltose stimulates the formation of sol. starch while levulose inhibits it.

JULIAN H. LEWIS

The synthetic capacities of pathogenic bacteria and their biological behavior under simple conditions of nutrition. II. The synthetic capacity of different bacterial species. H. BRAUN AND C. E. CAHN-BRONNER. *Centr. Bakt. Parasitenk., I Abt.* 86, 196-211(1921).—A basal medium having the following compn. is employed: 0.5% NaCl, 0.2%  $\text{K}_2\text{HPO}_4$ , 0.6%  $\text{NH}_4$  lactate, neutralized to litmus and then 0.7%  $\text{N NaHCO}_3$  added. *B. coli* maintains growth in this medium under aerobic conditions only. These results

are similar to those obtained previously with paratyphoid B. Mediums poor in Cl and Na inhibit *B. coli* and *B. paratyphosus* B. The addition of KBr increases growth; the Br ion probably substitutes for the Cl ion. *B. coli* is able to utilize lactose and sucrose; paratyphoid B is not. Anaerobic growth of *B. coli* with lactose or dextrose does not succeed in the basal medium. Cholera vibrios grow well in this medium. The elimination of NaCl greatly retards growth; KBr is not a complete substitute for NaCl. Metchnikoff's vibrio does not grow in the basal medium. Nitrates when added to this medium do not serve as a sole source of N for cholera vibrios or the colon bacillus. Proteus bacilli fail to grow anaerobically in the  $\text{NH}_4$ -lactate medium, even after the addition of  $\text{MgSO}_4$  or dextrose. *B. faecalis alcaligenes* grows less well than *B. paratyphosus* in the basal medium; withdrawal of NaCl or K inhibits growth. Friedländer's bacillus grows in the basal medium; withdrawal of NaCl does not noticeably influence growth; substitution of NaCl by KBr does not inhibit development. Pyocyanus in contrast to paratyphoid B and *B. coli* obtains its C and energy needs from Na formate. Oxalic, citric, lactic and succinic acids are satisfactory sources of C for pyocyanus. Typhoid and paratyphoid A do not grow in the basal medium. Addition of  $\text{Na}_2\text{SO}_4$ , KCl,  $\text{MgSO}_4$ ,  $\text{FeCl}_3$  or  $\text{FeSO}_4$  in various combinations produces no growth; substitution of citric or succinic for lactic acid or the addition of mannite produces no growth. Gram-positive bacteria are unable to utilize  $\text{NH}_3$  as their only source of N. *B. diphtheriae*, *B. xerosis*, *B. anthracis*, *Staphylococcus aureus* or *albus*, *Streptococcus longus*, and even *B. subtilis* cannot be cultivated in the  $\text{NH}_4$ -lactate or  $\text{NH}_4$ -succinate mediums; no growth occurs on the addition of sulfate, a Cu, Mg, or Fe salt or dextrose. *B. diphtheriae* and *B. anthracis* are unable to grow after the addition of tryptophan. Some Gram-positive bacteria may utilize amino acids as their source of N, e. g., *B. subtilis*. The authors suggest the study of toxins and enzymes under definite known nutritive conditions.

JULIAN H. LEWIS

**The use of *B. welchii* in the preparation of sugar-free culture medium.** S. B. RAN-DALL AND I. C. HALL. *J. Infectious Diseases* 29, 344-58(1921).—Because of the well known vigorous fermentative ability of *B. welchii* this organism is proposed for use in the removal of sugar from nutrient mediums. All protein substances to be used in the medium are added before inoculation. No special means of providing anaerobiosis are necessary other than inoculating before the medium is cool after sterilization as the depth in quantities such as are ordinarily used provides an adequate exclusion of air. The fermentation should be followed by means of acidity detns., best by H-ion concn. measurements. By cross fermentation tests with *B. welchii*, *B. coli* and *saccharolyte* it is shown that the removal of sugar is more complete with *B. welchii* than the other 2 organisms, although the time required for completion of action is the same for the 3 organisms.

JULIAN H. LEWIS

**Differentiation of hemolytic streptococci from human and bovine sources by the hydrolysis of sodium hippurate.** S. H. AYERS AND PHILIP RUPP. *J. Infectious Diseases* 30, 388-99(1922).—Hippuric acid is hydrolyzed by 44 hemolytic streptococci from the udders of cows, but not by 33 hemolytic streptococci of human origin. As much as 1% of hippurate may be split into benzoic acid and glycocholl. The hydrolysis is not affected by the H-ion concn. of the medium, at least under the exptl. conditions of this work. The compn. of the medium does not appear to affect the hydrolysis, provided it is suitable for the growth of the streptococci. Simple tests have been devised for the detection of the hydrolysis. The hydrolysis of Na hippurate seems to sep. the  $\beta$ -hemolytic streptococci of the bovine udder from all those of human origin but should be used at the present only with  $\beta$  hemolytic types. Particular attention is called to the fact that the usefulness of the hydrolysis of Na hippurate is discussed only in its relation to the  $\beta$ -hemolytic streptococci of human and bovine origin. The ability to split Na hippurate is not limited to the hemolytic types. Some of the  $\alpha$ -types from the udder of the cow do not produce the hydrolysis, while, on the other hand, the hydrolyzing property is common among the lactic type of streptococci. The test must not be applied indiscriminately, therefore, to all groups of streptococci.

JULIAN H. LEWIS

**Studies in bacterial metabolism. LXVII. Carbohydrate identification by bacterial procedures.** A. I. KENDALL. *J. Infectious Diseases* 32, 362-8(1923); cf. C. A. 17, 2583.—As various bacteria differ in their ability to utilize various sugars, with a collection of carefully standardized organisms, carbohydrates, both as they occur naturally and after the formation of cleavage products, can be accurately identified. Impurities in sugars can be detected and mixts. can be sepd. LXVIII. The measurement of carbohydrate mixtures by bacterial procedures. A. I. KENDALL AND S. YOSHIDA. *Ibid* 369-76.—For the detection of small amts. of sugars, alone or in the presence of larger amts. of other carbohydrates, there are necessary, first, a set of bacteria

of known fermenting powers; second, a set of carbohydrates of known purity; third, a set of standard phosphate solns. of known H-ion concn. If the suspected material is in considerable concn. ( $1/2$  to several %) the regular test for fermentation may be performed, using a suitable N-contg. medium as a basis. If the unknown carbohydrate is present in very small concn., recourse to the measure of the H-ion must be practiced. The identification of the carbohydrate requires a careful study of its fermentability in pure condition by the standard strains used. A concrete example is given in the identification of the sugars in a mixt. contg. *d*-glucose, fructose, mannose, galactose, lactose and sucrose. LXIX. Carbohydrate configuration and bacterial utilization. A. I. KENDALL, ROBERT BLY AND REBA C. HANER. *Ibid* 377-83.—A series of sugar derivs. was prepd., including gluconic and saccharic acids from *d*-glucose, mannonic lactone and mannosaccharic lactone from mannose, and galactonic acid from galactose. These acids in addition to the alcs., sorbitol, dulcitol, and mannitol, provided a considerable, but not complete, series of hexose sugars and derivs. which differ merely in the character of the terminal groups. The fermentation of these substances by a selected group of organisms was studied. All the organisms utilized glucose and most of them utilized galactose. The proteus group did not utilize levulose and mannose and some strains of the cholera vibrio failed to utilize mannose. These observations indicate that a common enol formation is not an absolute prerequisite to fermentation; otherwise, the members of the group that possess a common enol group (*d*-glucose, *d*-mannose and *d*-fructose) would theoretically be mutually convertible and mutually fermentable. Furthermore, gluconic and galactonic acids, which cannot readily undergo enolization, are fermentable by members of the proteus group. The alcs., mannitol, sorbitol and dulcitol, offer increasing difficulties to microbial decompn. in the order given, with a disproportionate refractoriness manifested by dulcitol. These expts., as a whole, fail to give any additional light on carbohydrate configuration and microbial decompn. and no data are acquired to justify a departure from the past methods of diagnosis and bacterial classification and introduce these various derivatives of the hexoses as means of identification.

JULIAN H. LEWIS

Bacterial growth on vitamin media. T. SHIBA. *Arch. Army Med. Corps* (Japan) No. 158(1922); *Japan Med. World* 3, 89(1923).—The presence of vitamins A, B and C favors the growth of *B. typhosus*, *Staphylococcus*, and *B. anthracis*, remarkably.

M. E. MAVER

Utilization of maltose, lactose, sucrose and triose by tubercle bacilli. A. FROUIN AND M. L. GUILLAUMIE. *Compt. rend. soc. biol.* 83, 1002-4(1923).—Tubercle bacilli can utilize disaccharides and their behavior towards the trioses suggests a relationship between tubercle bacilli and the mushrooms.

S. MORGULIS

Effect of glucose concentrations on the development and increase in weight of tubercle bacilli. A. FROUIN AND M. L. GUILLAUMIE. *Compt. rend. soc. biol.* 83, 1095-6(1923).—The yield of bacilli is increased by increasing the glucose concn. of the nutritive medium. The utilization of glucose is also augmented by the concn. In a 0.478% soln. 1 g. of dry bacilli uses up 2.37 g. glucose but in 4% soln. 5.84 g. are used up.

S. MORGULIS

Studies on the acid-proof staining property of cephalin. RYOICHI KOGANEI. *J. Biochem. (Japan)* 2, 495-503(1923); cf. *C. A.* 16, 4244. —In tubercle bacilli cephalin is the substance which is responsible for the acid-resistant property towards acid dyes. Expts. show that this property of cephalin is due to the difficulty of separating colamine from its mol. by treatment with acid, the colamine having the weakest staining power.

S. MORGULIS

A differential medium for streptococci. H. W. CROWE. *J. Path. Bact.* 26, 51-2(1923).—The streptococci are divided into four groups based on color reactions on the medium.

JOHN T. MYERS

Tomato extract as a culture medium. C. E. JENKINS. *J. Path. Bact.* 26, 116-8(1923).

JOHN T. MYERS

The formol titration of bacteriological media. J. H. BROWN. *J. Bact.* 8, 245-67(1923).—In the growth of bacterial cultures amino acids are often liberated from proteins in the medium. It is probable that such acid formation may be measured by the formol titration of Malfatti. Detailed methods are given.

JOHN T. MYERS

The fermentation of arabinose and xylose by certain aerobic bacteria. E. B. FRED, W. H. PETERSON AND J. A. ANDERSON. *J. Bact.* 8, 277-86(1923).—The fermentation of pentoses by *B. vulgatus*, *Acetobacter sorbose*, *A. xylinum*, *B. herbicola aurum*, and two yellow coccus forms called A and B are studied. The rate of fermentation of xylose and in certain cases of arabinose were slower than with the facultative anaerobic bacteria. The products of fermentation of the pentoses depends on the kind of organ-

ism. The ratio of the products depends on the age of the culture. *B. vulgatus* ferments xylose with the formation of acetone, EtOH, CO<sub>2</sub>, and a small amt. of fixed acids. As the culture grows older the ratio of acetone and EtOH to CO<sub>2</sub> decreases. The max. amt. of acetone and EtOH is found about the sixth day. In the case of *A. xylinum* an increase in the age of the culture is accompanied by an increase of acetone and EtOH. Although in different proportions the substances obtained by the breaking down of xylose are the same as those noted with *B. vulgatus*. The remaining organisms studied ferment the pentoses slowly. They form a trace of acid but the chief end product is CO<sub>2</sub>.

JOHN T. MYERS

**Nutrition of infusoria.** ANDRÉ LWOFF. *Compt. rend.* 176, 928-30(1923); cf. Peters, *C. A.* 16, 2937, 3100.—*Colpidium colpoda* isolated from an infusion of hay was grown in peptone bouillon dild. with 2 vols. of distd. H<sub>2</sub>O. *Colpidia*, which grow abundantly in water of condensation of ascitic gelose bouillon and of the ordinary gelose bouillon of the bacteriologists, form colonies in 2 or 3 days upon the solid part of the medium. In their natural conditions the nutrition of the free infusoria appears to be purely phagocytic.

L. W. RIGGS

**Adaptation, transmission of acquired characters and selection by competition in the lactic bacillus.** HENRY CARDON AND HENRI LAUGIER. *Compt. rend.* 176, 1087-90 (1923); cf. *C. A.* 16, 732, 2345, 3101.—The bacilli were grown for a year in a medium contg. 34.2 g. KCl per l., being reseeded every 48 hrs. A suitable control without KCl was carried. The bacilli in the KCl stock gradually adapted themselves to the medium and after some fluctuations attained a growth, as measured by the acid produced, of 80% of those in the control. Bacilli thus accustomed to KCl could live in mediums contg. 54 g. KCl per l., although 34.2 g. per l. was the max. concn. in which unaccustomed bacilli could live. This modification of the bacilli is not specific, since they show increased resistance to other alkali and alk. earth salts but not to glycerol or sucrose. If adapted and non-adapted bacilli are sown in a medium contg. 30 g. KCl per l. the non-adapted bacilli produce in 48 hrs. at 38° only 27% as much acid as the adapted bacilli. This adaptation persists through thousands of generations since after 4 months of cultivation in a medium contg. no KCl, the acquired resistance to KCl was almost entirely preserved. If the adapted and non-adapted strains are grown together in an ordinary medium (without KCl) the strain adapted to KCl is rapidly and completely eliminated by the other, thus showing selection in living competition.

L. W. RIGGS

**A phenomenon in the agglutination of typhus bacteria in salt-poor mediums.** N. NISHIGUCHI. *Biochem. Z.* 135, 165-73(1923).—When typhus-immune serum is dild. with 0.025 to 0.85% NaCl or Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> soln., the usual agglutination of typhus bacilli may be brought about with dilns. of 1:10 to 1:50,000. If distd. water or more dil. salt solns. be used as diluent, the usual agglutination occurs in 1:10 to 1:100 dilns. and in 1:1000 to 1:10,000 dilns. But with dilns. of 1:200 to 1:500 there is a gap. Here agglutination does not occur. Expts. directed toward the explanation of this phenomenon were unfruitful.

GEORGE ERIC SIMPSON

**The occurrence of *p*-hydroxybenzaldehyde and *p*-hydroxybenzoic acid in the bacteriological decomposition of tyrosine, with special reference to the melanin formed therefrom.** KINSABURO HIRAI. *Biochem. Z.* 135, 299-307(1923); cf. *C. A.* 15, 1916.—On prolonged action of *Proteus vulgaris* on tyrosine, *p*-HOC<sub>6</sub>H<sub>4</sub>CHO and *p*-HOC<sub>6</sub>H<sub>4</sub>CO<sub>2</sub>H are formed. It is not known whether the latter is produced by direct action of the bacteria on tyrosine or by autoxidation of the aldehyde. During these prolonged expts. melanin seps. The following procedure gives the largest yield of melanin. A soln. contg. 631 cc. Ringer soln. plus 169 cc. Henderson's phosphate mixt. plus 2 g. *L*-tyrosine plus an emulsion of *Proteus vulgaris* is kept at 37° for 2-4 weeks. The mixt. is pptd. with Pb(OAc)<sub>2</sub>. The ppt. is suspended in alc., treated with H<sub>2</sub>S, this blown off, and the alc. evapd. under diminished pressure. After repeated sepn. from alc. the material is digested in H<sub>2</sub>O and redissolved in alc. The product is taken up in NaOH and pptd. with H<sub>2</sub>SO<sub>4</sub> until Millon's test is no longer positive. Glycerol in the reacting mixt. prevents melanin formation; but spongy Pt overcomes this inhibition. This melanin differs in its properties from melanins from other sources. It contains no Fe, N or S. It is difficultly sol. in H<sub>2</sub>O, mineral acids, Et<sub>2</sub>O, CHCl<sub>3</sub>, and benzene; easily sol. in alkali, alc., HCOOH, HOAc, MeOH, Me<sub>2</sub>O, phenol and AcOEt. It does not mp. below 290°.

GEORGE ERIC SIMPSON

**The synthesis of dextrorotatory  $\beta$ -furyl- $\alpha$ -lactic acid by proteus bacteria.** TAKAOKI SASAKI AND ICHIRO OTSUKA. *Biochem. Z.* 135, 504-5(1923); cf. *C. A.* 15, 3654.—From 2 g. *dl*-furylalanine, 1 g. *d*- $\beta$ -furyl- $\alpha$ -lactic acid was obtained after 25 days incubation. The incubation mixt. was evapd., extd. with ether, and the cold ext. pptd.

with petroleum ether to obtain the crystalline needles, m. 95-6°;  $[\alpha]_D^{18} = +27.36$ .

GEORGE ERIC SIMPSON

**Bacteriostasis by mixtures of dyes.** J. W. CHURCHMAN. *J. Exptl. Med.* **38**, 1-7(1923); cf. *C. A.* **17**, 1818.—It is possible to mix two dyes of opposite selective bacteriostatic powers and obtain a mixt. which combines the powers of the two components. This possibility has been established by expts. with gentian violet, which has a predilection for Gram-positive organisms, and acriflavine, which has a predilection for Gram-negatives; a mixt. of these two dyes is bactericidal for both groups of bacteria. The weakness of each dye, when used alone, is thus, in the mixt., fortified by the strength of the other.

C. J. WEST

**Rapid method of bacterial count applicable to industrial control.** EMM. POZZI-ESCOR. *Ann. chim. anal. chim. applicata* **5**, 130-2(1923); *Bull. soc. chim. belg.* **32**, 250-3.—Exception is taken to the Breed microscopic count method because of the large numerical error made possible in the method through incorrect manipulation. A new method is proposed which makes use of the Wright method for detg. the opsonic index in measuring the strength of vaccines. One drop of fresh normal blood is dild. with 500 cc. of isotonic serum. A drop of this soln. is carefully mixed with one drop of milk on a microscopic slide. After spreading and drying, the slide is immersed in a flask of xylene, or a few drops of xylene are dropped directly on the prepn. The fat is absorbed from the slide after 1 to 3 min. The prepn. is then plunged for 3 min. in alc., and finally in a mixt. of alc. and ether. It is now stained for  $\frac{1}{2}$  min. in a satd. aq. soln. of methylene blue or thionine. The bacteria are colored blue by this operation. For differentiating the bacteria and red blood cells, it is necessary to decolorize by immersing the stained slide in MeOH. The bacteria will appear blue and the blood cells will appear red. It is therefore possible to establish a relationship between the no. of red blood cells and the bacterial cells appearing in the field of the microscope. An av. of 500,000 red blood cells per cc. exists in the dildn. of blood employed. To det. the bacterial count of the milk under examn., the following formula is used: No. of bacteria = (500,000  $\times$  no. of bacterial cells in field)/no. of red blood cells in field. This method is considered especially in connection with the bacterial count of market milk.

H. F. ZOLLER

Development of paratyphoid-enteritidis groups in various foodstuffs (KOSER) **12**.

BUCHANAN, ESTELLE D. and BUCHANAN, ROBT. E.: *Bacteriology*. Revised ed. London: Macmillan. 560 pp. 12s.

ORTICONT, A. and CLOGNE, R.: *Pratique bacteriologique*. Paris: Libr. Le Francois. 489 pp. Fr. 20.

PIORKOWSKI, IDA: *Bakteriologische und serologische Technik*. Leipzig: G. Thieme. 210 pp.

## D—BOTANY

B. M. DUGGAR

**Biochemical study of Laminaria. Variations of the principal constituents, their dependence on external conditions.** P. FREUNDLER, Y. LAURENT AND Y. MENAGER. *Bull. soc. chim.* **31**, 1341-7(1922); cf. *C. A.* **16**, 1449, 1450.—A continuation of studies of the I and carbohydrate concn. of *Laminaria cloustoni*, *L. flexicaulis* and *L. saccharina* collected at different times of the year off the Brittany Coast. The young individuals only of these species were used, but wide variations were found in the I and carbohydrate contents at different seasons. Differences of I contents in 1921 and 1922 are ascribed to changes in these years of the ocean currents.

F. A. CAJORI

**The relation between microorganisms and green plants.** RENATO PEROTTI. *Atti accad. Lincei* **30**, 233-7(1921); *Botan. Abstracts* **12**, 134.—Sterilized decoctions of 3 types of cultivated plants, Cruciferae, Leguminosae, and Graminaeae, were each inoculated with a suspension of garden soil, and the amts. of ammonification, nitrification, and denitrification detd. The max. ammonification took place in the decoction of Leguminosae, the least in that of the Graminaeae. Denitrification was slight in all cultures. Nitrification was greatest in the Graminaeae and least in the Leguminosae. After 20 days there was abundant development of Hyphomycetes in the cultures of Leguminosae, only a few in Graminaeae, and almost none in Cruciferae.

H. G.

**The chlorine content of the sugar beet during vegetation.** EMILIS SAILLARD. *Ann. sci. agron.* **38**, 152-7(1921); *Botan. Abstracts* **12**, 13.—Analyses are reported showing the water, N, ash, and chloride content of different parts of the beet at 5 periods of growth. The petioles together with the principal vein of the leaves are shown to

contain most of the Cl, and in all cases the Cl content increases as the season progresses.

H. G.  
Some notes on the enzymes of the avocado. E. M. CHACE. *Calif. Avocado Assoc. Ann. Rept.* 1921-1922, 52, 53; *Expt. Sta. Record* 48, 108.—The avocado contains a catalase which is present in both the immature and the mature fruit. Oxidase or peroxidase is present in most of the varieties thus far examd. Emulsin has been found in nearly all of the soft samples examd. Lipase has not been identified. H. G.

Chemical studies on safflower seed and its germination. V. A. TAMHANE. *Mem. Dept. Agr. India Chem. Series* 6, No. 7, 223-244(1923).—The safflower seed (*Carthamus tinctorius*) contains reserve materials chiefly in the form of oil and protein. In the resting seed there are no starch, no glucosides, no tannin; there is a small proportion of non-reducing sugars. During germination the compn. changes little until the radicle protrudes from the seed. The oil then disappears and the N-free cxt. increases. Non-reducing sugars gradually increase and reducing sugars rise to a definite amt. and then vary little. The lipase occurs very largely in the form of a zymogen. The amt. of active enzyme in the resting seed is small and increases very little in the early stages of germination, reaching a max. when the lateral roots appear and then declines. Expts. cited lead to the conclusion that not all acidification of the oil during germination is due to enzyme action.

RUSSELL M. JONES  
A note on hydrocyanic acid in the Burma bean (*Phaseolus lunatus* sp.). F. J. WARTH. *Mem. Dept. Agr. India Chem. Series* 7, No. 1, 1-29(1923).—Expts. with the Burma bean macerated and unmacerated leaf, for the detn. of HCN, lead to the conclusion that several methods of analysis should be employed to corroborate one another (cf. Alsberg and Black, *C. A.* 10, 1872). With fresh leaves the autoenzyme process gave higher results than the acid hydrolysis method. When fresh leaves are plunged into boiling H<sub>2</sub>O the glucoside hydrolyzes and part of the HCN is converted into a form not recoverable by acid hydrolysis. During sun-drying of the leaf, hydrolysis takes place with evolution of HCN. Slow drying also causes loss of HCN but none is evolved, auto-digestion taking place. HCN has a powerful effect on cell permeability in the fresh leaf and also acts as a regulator or hormone. The hydrolytic enzyme is active in the fresh green stalk but becomes weak as the plant matures. The green pod and young ripe seed possess no hydrolytic power.

RUSSELL M. JONES  
Preliminary investigations of the pectic substance of plants. R. G. W. FARNELL. *Intern. Sugar J.* 25, 248-251(1923).—The pectins are now regarded as a constituent of the middle lamellae of all plant cells. During the ripening of fruit a part of the pectin is rendered sol. and enters the juice of the fruit. Pectins may be classified as tissue and juice pectins. Since the first is the source of the latter, it is known as pectinogen. Plant tissue pectinogen seems to be loosely combined with Ca, and can be extd. with oxalic acid and alc. When dry, pectinogen is white in color, forming a viscous colloidal soln. in water. Dialyzed pectinogen has a slightly acid reaction; 0.3 g. neutralizes 1 cc. of 0.1 N NaOH. It contains pentose (araban), galactan and methoxyl groups. It is dextrorotatory;  $[\alpha]_D^{20}$  varies from 250 to 330. Pectic acid is formed from it by alkalis or by the enzyme pectase. Turnips, onions, and pea pods contain 20, 16 and 8%, resp., of dry pectinogen. Pectinogen from various sources varies in compn. The method for its detn. is based upon its conversion into pectic acid and pptn. by CaCl<sub>2</sub> in the presence of AcOH. Pectinogen is not appreciably adsorbed by less than its own wt. of Norite.

W. L. OWEN  
The availability of iron in nutrient solution for wheat. W. E. TOTTINGHAM and E. G. RANKIN. *Am. J. Botany* 10, 203-210(1923).—Results are given relative to the soly. and availability to young wheat plants of various compds. of Fe in a particular form of nutrient solns. Soly. tests at different  $p_H$  values of the soln. have shown that FePO<sub>4</sub> is relatively insol. This is true of Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> and FeSO<sub>4</sub> at a H-ion concn. of the Fe-free nutrient soln. approaching neutrality. While ferric citrate is not very sol. it possesses the advantage of remaining sol. over a considerable range of  $p_H$  values of the nutrient soln., Fe<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> increases the H-ion concn. of the nutrient soln. here used, while ferric citrate causes the opposite effect. The other forms of Fe tested have little influence in this respect. Growth measurements of young wheat plants show that ferric citrate was decidedly the most favorable form of Fe here employed. The variation in efficiency of Fe in the forms supplied is correlated with variation either in the soly. of this element or in the modification of the  $p_H$  value of the nutrient soln. FePO<sub>4</sub> is likely to be inefficient because of its low soly. Ferric citrate supplied at the rate of 10 mg. of Fe per l. of the nutrient soln. employed here is not completely dissolved, but seems to provide abundant Fe for the growth of the young wheat plant, where the nutrient soln. is renewed.

J. J. SKINNER



The effect of hydrogen ion on the protoplasm of the root hairs of wheat. RUTH M. ANNOMS. *Am. J. Botany* 10, 211-20(1923).—The abnormal root development and decreased growth that have been observed in plants grown in nutrient soln. that contains relatively large amts. of  $\text{KH}_2\text{PO}_4$  may be explained by the coagulation of the protoplasm of the root hairs. This coagulation, which is accompanied by flocculation, is induced by the H ions formed by dissociation of the phosphate. The H-ion concn. of the nutrient solns. employed varied from  $p_H$  3.94 to  $p_H$  3.47. The relation of this coagulation and flocculation to the colloid chemistry of the protoplasm is discussed. The lack of logic in the attempts of certain investigators to find a direct relation between environmental features, such as H-ion concn., and the dry wt. of plants, is pointed out.

J. J. SKINNER

Carbon assimilation. D. THONAY. *South African J. Sci.* 19, 52-63(1922).—Review of recent work, particularly that of Willstaetter.

H. A. SPOHR

## E—NUTRITION

PHILIP B. HAWK

## NORMAL

A study of nitrogen metabolism in the dairy cow. C. CROWTHER AND H. E. WOODMAN. *J. Agr. Sci.* 12, 40-56(1923).—Results reported cover 2 expts. lasting from 196 to 722 days and are a result of a study of the "nitrogen-balance" of 2 cows in each expt. In one both cows were dry and not in calf, while in the other expt. one was dry and not in calf, and the other one was pregnant after 302 days and its record was followed throughout the stages of pregnancy and parturition and for 136 days of active lactation. The outstanding features of the results are as follows: Progressive increase of N consumption beyond the fundamental requirements of the dry cow causes the rate of N retention to increase steadily and then to fall. A protein supply of 2.4 kg. per 1000 kg. live wt. produces this max., and this figure may be independent of the nature of the foods fed with the hay. N equil. is delayed when the ration is such as to cause initial N retention, also the rate of retention is depressed. This N equil. never becomes const., showing that long-period expts. are essential in these studies. In the earliest stages of pregnancy the requirement for maintenance of N equil. is increased, persisting at a steadily reduced rate for about 15 to 20 weeks, after which it is very small, and it is noted that profound disturbances of N metabolism mark this early period also. During parturition and a few days subsequently the output of N is more than can be restored rapidly by food consumption. It seems that in order to maintain equil. during lactation the food must supply twice to 3 times the amt. of N in the milk, in addn. to that required for the maintenance of equil. in the "dry" state.

R. B. DERMER

The food value of seed of *Ervum Ervilia*. IV. SABATO VISCO. *Atti accad. Lincei* 31, 391-4(1922); *Botan. Abstracts* 12, 249; cf. C. A. 17, 1986.—Rats fed with flour made from the seed of *Ervum Ervilia* to which a small proportion of purified casein from milk had been added showed none of the loss in weight or symptoms of disease resulting when fed on the seed of *E. Ervilia* alone.

H. G.

The availability of calcium salts. H. STEENBOCK, E. B. HART, M. T. SELL AND J. H. JONES. *J. Biol. Chem.* 56, 375-86(1923).—Rats were fed on a basal ration of yellow Indian corn 50, purified casein 13, butter fat 5, dextrin 32, NaCl 1, Fe citrate 0.14 parts, or of purified casein 18, agar 2, cod liver oil 2, yeast 2, dextrin 73.6 and salt mixt. 2.4, to which there had been added 0.3% Ca in the form of  $\text{CaCO}_3$ ,  $\text{Ca}(\text{PO}_4)_2$ ,  $\text{CaSO}_4$  or Ca silicate (pptd. and dried at  $110^\circ$ ). All did equally well. Even when only 0.1% Ca was added to the second basal ration, there were no differences in the availability of the different forms of Ca.

I. GREENWALD

The synthesis of "bios" by yeast grown in a solution of purified nutrients. MARGARET B. MACDONALD. *J. Biol. Chem.* 56, 489-99(1923).—Expts. with *Saccharomyces cerevisiae*, *S. ellipsoideus* and yeast XII showed that there was an increased production of yeast in a sucrose-mineral salts medium to which EtOH or  $\text{H}_2\text{O}$  exts. of the above named yeasts, commercial yeasts, wheat germ, malt, peptone, Liebig's ext. of beef and autoclaved steak had been added. Exts. of yeasts grown in a distd.- $\text{H}_2\text{O}$  soln. of pure sugar and nutrient salts served to stimulate the growth of seedlings in such a medium in a manner comparable in effectiveness with that of exts. of commercial yeasts. Apparently, yeast synthesizes a substance, which stimulates the growth of the culture to which it is added. This is the "bios" of Wildiers (*La cellulose* 18, 313(1901)). It does not act as does a vitamin, for animal growth does not proceed at all in the absence of vitamin, whereas the yeast grows, though slowly, and even produces "bios," when it

is totally absent, cf. Funk and Dubin, *C. A.* 15, 1338; 16, 730; 17, 126, and Souza and McCollum, *C. A.* 14, 3685. I. GREENWALD

**Basal metabolism and the menstrual cycle.** GLEN WAKEHAM. *J. Biol. Chem.* 56, 555-67(1923).—Ninety-eight detns. of basal metabolism in 24 nurses, under conditions of great uniformity, showed that there was a distinct fall in basal metabolism during or immediately after menstruation. Statistical analysis of the results of Blunt and Dye (*C. A.* 15, 2657) leads to the same conclusion, although B. and D. did not believe so because the av. daily fluctuations were greater than the changes due to menstruation. Further tentative conclusions are that basal metabolism is considerably higher, on the av., in those engaged in strenuous labor than in those of sedentary occupations; that it fluctuates less in those living under uniform conditions than in those whose mode of life is more varied; that the variations due to the menstrual cycle, while always less than the daily variations, are always greater in active than in sedentary individuals; that causes which produce too frequent menstruation are likely to be accompanied by high basal metabolism and that causes which delay or suppress menstruation are likely to be accompanied by low basal metabolism. I. GREENWALD

**A study of the calcium balance of cows.** W. G. GAESSLER AND A. C. McCANDLISH. *J. Biol. Chem.* 56, 663-78(1923).—Variations in loss of Ca as insol. soaps due to variations in the fat content of the ration do not appear to be important factors in the Ca balance of dairy cows, nor was this affected by the acids of corn silage. Positive Ca balances could be obtained only by the use of good alfalfa hay. Hay that was 1.5 yrs. old was ineffective, even with a dry cow. The results accord with the view that fresh hay contains a vitamin favoring Ca absorption, which vitamin is destroyed on storage. Cf. Hart, Steenhock and Hoppert, *C. A.* 15, 4021. I. GREENWALD

**Does the chick require the fat-soluble vitamins?** A. D. EMMETT AND GAIL PEACOCK. *J. Biol. Chem.* 56, 679-93(1923).—If young chicks are deprived of fat-sol. vitamin, ophthalmia appears and unless the vitamin is supplied, death eventually ensues. Leg weakness is more apt to occur in chicks 10 to 14 days old than in those more than 24 days old at the time they are deprived of the fat-sol. vitamin. Chicks dying after deficiency of fat-sol. vitamin show deposits of urates in the tubules of the kidneys and, at times, on the surface of the heart, liver and spleen. Young chicks require more H<sub>2</sub>O-sol. vitamin than do young rats but neither young chicks nor young pigeons require vitamin C (ascorbic). Young and mature pigeons require little, if any, fat-sol. vitamin. Cf. Sugiura and Benedict, *C. A.* 17, 1271. I. GREENWALD

**Concerning the new vital constituents of nutritive and food materials and their importance to agriculture.** SCHEUNERT. *Mitt. deut. Landw.-ges.* 38, 229-32(1923).—A general discussion of the occurrence of vitamins in agricultural products and their significance as constituents of foods for stock. K. D. JACOB

**The possibility of urea as a source of protein in ruminants. The excretory function of the skin.** ARTHUR SCHEUNERT, WILHELM KLEIN AND MARIA STEUBER. *Biochem. Z.* 133, 137-91(1922).—From expts. in which urea was administered to animals as the source of N, it has been found impossible to demonstrate that it can function as a source of protein. J. C. S.

**The effect of exercise on vitamin requirements.** M. HELEN KEITH AND H. H. MITCHELL. *Am. J. Physiol.* 65, 128-38(1923).—Exercise hastens the appearance of the symptoms of vitamin A deficiency in white rats indicating an increased demand for vitamin A due to muscular activity. Muscular work apparently had no effect on the vitamin B requirement of the animals. J. F. LYMAN

**Effects of a restricted diet. I. On growth.** J. R. SLONAKER AND T. A. CARD. *Am. J. Physiol.* 63, 503-12(1923).—Comparison was made in rates of growth of white rats fed (1) a diet of table scraps from which all animal protein was removed as much as possible and (2) a diet of table scraps plus some form of animal protein. Rats fed the "vegetarian" diet reached max. wt. at an earlier age than did the omnivorous group, but averaged 35% smaller for the females and 25 to 28% for the males. The "vegetarian" diet caused a shortening in the span of life and a lessened production of young, which were below normal wt. at birth and which grew at a subnormal rate. In expts. extending over 8 years it has been impossible to maintain rat families beyond 3 generations on the vegetarian diet. The beneficial effect of the supplementary animal protein may be due (1) to additional protein more readily utilized by the animal as such, or (2) to a stimulating effect of the animal protein on the body cells, enabling them to utilize more efficiently the vegetable foods consumed. II. On pubescence and the menopause. *Ibid.* 64, 35-43(1923).—Rats on "vegetarian" diet showed a delayed pubescence, a decidedly shorter period of sexual activity and a four-fold increase in sterility as compared with animals receiving animal protein in the diet. III. On the

number of litters and young born. *Ibid* 167-80.—A "vegetarian" diet fed to rats causes: (1) an increase in impotency, (2) reduced fecundity, (3) loss of power of reproduction and extinction of the line of descent by the third generation. Animals still capable of reproduction are restored to nearly normal conditions by an omnivorous diet. IV. On the age of greatest productivity. *Ibid* 203-9.—A "vegetarian" diet for rats results in the production of fewer and smaller litters of young with a great reduction in the period of reproductive activity. V. On mortality, cannibalism and the sex ratio. *Ibid* 297-310.—Mortality of the young and cannibalism were increased in rats restricted to a diet from plant sources as compared with an omnivorous diet. In the third generation on the "vegetarian" diet mortality was 100%. The general effect of the "vegetarian" diet on the sex ratio was greatly to reduce the proportion of males.  
J. F. LYMAN

The concentration of sugar in the blood of the rabbit during inanition and after ingestion of dextrose. E. L. SCOTT AND T. H. FORD. *Am. J. Physiol.* 63, 520-34 (1923).—Samples of arterial blood were taken from the heart, dextrose detms. made by a modification of MacLeans method and the inanition periods were of 24 hrs. duration. The dextrose in 100 cc. of such blood is 118 mg. with a standard deviation of about  $\pm 22$  mg. When rabbits are fed 1 g. dextrose per kg. body wt. there is a sharp rise in blood sugar which reaches a max. in about 30 mins. though there will be a few cases (about 20%) in which the rise will be about the same as would be expected in fasting individuals. At the end of 2 hrs. blood sugar falls to normal and frequently there is a distinct hypoglycemia 3 hrs. after ingestion of the dextrose. When 2 and 4 g. dextrose per kg. body wt. are ingested there is a still greater rise giving practically the same max. in both cases at the end of 30 mins. With this dosage there would be very few animals showing blood sugar values that could be confused with those given by the controls. When 2 or 4 g. dextrose are fed there is a tendency to maintain a max. blood sugar for some time which is more marked with the larger amt. The rate of fall in blood sugar is more rapid the higher the concn. of sugar in the blood, after it has once begun. The results are interpreted to show that there is a max. rate of absorption from the intestine beyond which the organism cannot go, regardless of the amt. of the sugar fed. In making alimentary glucemia tests the amt. of sugar fed should be slightly more than enough to give the max. rate of absorption. For the rabbit, 2 g. per kg. is recommended.  
J. F. LYMAN

Influence of the antineuritic vitamin upon the internal organs of single-comb white leghorn cockerels. A. J. SOUBA. *Am. J. Physiol.* 64, 181-201 (1923).—Three pens of cockerels fed the following rations were compared: (1) normal mixed ration; (2) "synthetic" ration well supplied with vitamins A and B; (3) synthetic ration deficient in vitamin B but otherwise like ration (2). On ration (3) there was a decrease in the size and wt. of organs in the following order: testes, spleen, heart, liver, kidneys, pancreas, and thyroid. The testes were affected to the greatest extent. These organs not only failed to develop but there was an ultimate atrophy. On ration (3) there was an increased wt. of the adrenals when computed per kg. body wt. The observation of Karr (*C. A.* 15, 382) of a relationship between appetite and vitamin B in dogs was noted in poultry also.  
J. F. LYMAN

The laxative action of yeast. J. R. MURLIN AND H. A. MATTELI. *Am. J. Physiol.* 64, 275-94 (1923).—Raw yeast, added to a carefully regulated diet, produced a laxative effect in human subjects as shown by more frequent defecation, and by increased bulk and moisture content of the stools. In the majority of cases yeast caused an increase in the abs. elimination of N and also in the % of N in the dried stool. The elimination of phenols in feces and urine indicated that putrefaction is somewhat diminished by the ingestion of yeast. Boiled yeast does not produce as much laxative effect as raw yeast, and is more digestible. Urinary uric acid is increased when 3 cakes of compressed yeast are eaten per day and becomes even higher in the control period immediately following. Dogs digest yeast protein to such an extent as to obscure any tendency to increase the excretion of N by the bowel; 4 cakes per day give a marked laxative effect on dogs.  
J. F. LYMAN

Biological food tests. I. Vitamin A in some citrus fruit products. A. F. MORGAN. *Am. J. Physiol.* 64, 522-37 (1923).—The products were judged (1) by their curative effects on rats and (2) by their effects on growth of rats, when the diet contained no other source of vitamin A. Two samples of orange-peel oil (obtained by ether extn. and by cold pressure) contained vitamin A in amts. not far different from that found in fresh com. cod-liver oil. A sample of oil prepd. by cold pressure from Valencia oranges that had hung on the trees several weeks after reaching maturity was practically devoid of vitamin A, while a fourth sample obtained by steam distn. was also valueless. The

vitamin content of the 4 oils was of the same order as their depth of color. Dried outer orange peel in doses of 0.5 to 1 g. (single dose) was effective in curing xerophthalmia; lemon peel was somewhat less effective. Orange juice, concd. *in vacuo*, cured the typical eye disease brought on by vitamin A deficiency, in doses corresponding to 12 to 30 cc. of the fresh juice. Lemon oil and grape-fruit peel were ineffective as a source of vitamin A. II. Vitamin A in skim milk. *Ibid* 538-48.—Five g. dried skim milk (spray-process product) daily was less effective as a source of vitamin A for young white rats than 0.25 g. butter fat. On this basis it is estd. that av. whole milk should be more than 8 times more concd. in vitamin A than the skim milk sepd. from it.

J. F. LYMAN

Variations in the carbon dioxide content of the blood constituents in relation to meals. E. C. DODDS AND J. MCINTOSH. *J. Physiol.* 57, 139-42 (1923).—The changes in alveolar  $\text{CO}_2$  subsequent to the ingestion of meals (cf. C. A. 15, 2484) are associated with changes in  $\text{CO}_2$  content of the whole blood, the  $\text{CO}_2$  of the blood rising during gastric secretion and falling during the period of depression of alveolar  $\text{CO}_2$  tension which has been associated with the pancreatic secretion. The plasma during the period of gastro-intestinal secretion shows practically no change either in  $\text{CO}_2$  content or in alk. reserve. All the changes in  $\text{CO}_2$  content following meals occur in the corpuscles.

J. F. LYMAN

Nitrogenous food and organic acids in the urine. R. GOIFFON. *Compt. rend. soc. biol.* 88, 1033-4 (1923).—Expts. show that there is a proportionality between the elimination of org. acids and the nitrogenous metabolism: The org. acid/urea ratio varies with the individual, also in pathol. conditions such as ketosis. S. MORCULIS

Purine metabolism. III. The significance of muscles as a source of endogenous purine. MITSUO KUROCKI. *J. Biochem. (Japan)* 2, 409-16 (1923); cf. C. A. 16, 1604.—The purine content of tetanized gastrocnemius muscles diminishes. The endogenous purine N of the urine (uric acid + allantoin N) increases about 30% when the muscles are stimulated or exerted; the increase in the blood is much smaller but nevertheless appreciable. The creatine and creatinine of the muscle or of the urine may either increase or decrease as the result of tetanization. The rabbits on which these expts. were made remained in good condition all through the tests, and maintained N equil. and a const. body wt. S. MORCULIS

The antiscorbutic value of the different elements of milk. E. LESNÉ AND (MISS) DUBÉVILL. *Bull. soc. pédiat.* 21, 29 (1923); *Bull. soc. hyg. alim.* 11, 322 (1923).—Guinea pigs were fed the following diet: oats, bran and hay sterilized one hr. at 120°. One group received 100 cc. of completely skimmed milk a day, and another 100 cc. of buttermilk, and at the end of 1 month neither showed any signs of scurvy. A third group, which was given butter and casein dild. in water equiv. to 100 cc. of milk, died after 4 weeks and showed typical lesions of exptl. scurvy. Vitamin C must, therefore, be in solut. in the water of the milk. A. PAPINBAU-COUTURE

Studies on the vitamin potency of cod-liver oils. III. The potency of pollock-liver oil. Early summer oils. A. D. HOLMES. *J. Metabolic Research* 2, 361-5 (1922); cf. C. A. 17, 577.—The vitamin A potency of the oils obtained from fresh livers of pollocks caught both in the emaciated and in the well nourished conditions were studied on white rats. Of the liver oil of emaciated pollock a min. of 3.4 mg. per day was required to meet the demands for vitamin A, whereas of the liver oil of plump pollock only 1.9 mg. per animal per day was sufficient for the same purpose. W. A. PERLZWEIG

Feeding experiments on rats with plants at different stages of development. I. Experiments with corn. BENJAMIN HARROW AND FRANCIS KRASNOW. *J. Metabolic Research* 2, 401-15 (1922).—No evidence has been obtained in these expts. that either vitamin A or B (or D?) is formed during germination of corn. The addn. of dried corn, germinated or ungerminated, to a vitamin-free basal diet to the extent of 5%, induces growth in rats for a considerable length of time. Cold alc. exts. of dried corn (with concns. of alc. from 50 to 80%) contain little, if any, vitamin, though the response in rats with an ext. of ungerminated corn is slightly more favorable than with the germinated variety. When undried is substituted for dried corn, there may be an initial growth, but this is followed by loss of weight, and often by eye trouble, paralysis and ultimate death. This applies to germinated, ungerminated and seedling stages of corn. W. A. PERLZWEIG

Vitamins and cereal decoctions. MAURICE SPRINGER. *Presse méd.* 31, 208-11 (1923). W. A. P.

Is the lack of vitamin specifically inhibitory of oxidation? KIGOSHI MORINAKA. *Biochem. Z.* 135, 603-9 (1923).—Two dogs on a vitamin-free diet showed no increase in the volatile fatty acids of the urine after NaOAc administration. Therefore, the ability

to oxidize NaOAc is not impaired. Since urinary S-partition is normal, the intermediary metabolism of protein is also unaffected.

GEORGE ERIC SIMPSON

Organic foodstuffs with specific action. XXVI. EMIL ABDERHALDEN. *Arch. ges. Physiol.* (Pflüger's) 198, 571-82(1923); cf. C. A. 17, 2132.—The parenteral injection of tyramine and histamine, and sometimes of hydroxyethylamine, prevents the development of the convulsions which characterize the state due to the continued feeding of pigeons upon polished rice. XXVII. Experiments in geese. Cellular enzymes. EMIL ABDERHALDEN AND ERNST WERTHEIMER. *Ibid.* 583-9.—Feeding with polished rice produced the symptoms of alimentary dystrophy in geese. The organs of normally fed geese were not materially different in diastase from those of the dystrophic geese. The marked reduction in polypeptidase in the tissues of the pigeons upon rice diet may be associated with the hunger condition and not directly referable to the type of food.

G. H. S.

Nutritive value of soy-bean and peanut proteins. TOKITAKA SHIBA AND MANSHEI KOYAMA. *J. Chem. Soc. Japan* 44, 58-68(1923).—Peanuts obtained on the market (analyses given) were dried at 70-80°, ground and the fat was removed by alc.-Et<sub>2</sub>O. After pulverization, they were again extd. with Et<sub>2</sub>O so that the fat content is less than 1%. The sample thus prepd. contained on the basis of air-dried material 13.80% H<sub>2</sub>O, 8.90% total N, 0.14% fat, 4.00% crude fiber, 3.64% crude ash, 55.82% crude protein and 23.4% sol. non-nitrogenous substance. This was fed to albino rats, 28 parts of protein-free milk, 14 parts of butter, 14 parts of protein (the samples), and 44 parts of starch and cellulose being given. Rat A (98 g.) increased in wt. to 326 g. in 180 days, and rat B (84 g.) to 311 g. Further chem. analyses of peanut protein showed that globulin, sol. in 10% NaCl, (arachin and conarachin) constitutes the main portion of the albumin, which contains 25.29% arginine N, 4.15% lysine N, 5.04% histidine N and 0.90% cystine N of the total N. The distribution of PO<sub>4</sub> in the samples was: total 2.12%, inorg. 0.23%, org. 1.89%, alc.-Et<sub>2</sub>O-sol. 0.08% and nucleic acid-like PO<sub>4</sub> 0.3%. Soy beans were freed from fat (less than 1%), and the diets contg. 14% soy-bean protein were used for feeding expts. The soy-bean meal thus prepd. contained 9.97% H<sub>2</sub>O, 40% crude protein, 0.9% crude fat, 7% crude fiber, 4.1% ash, and 29.4% non-nitrogenous substances. Growth with soy-bean protein was not quite as good as with peanut protein.

S. T.

Protein of rice embryo and its nutritive value. MATSUKICHIRO HAMADA. *J. Chem. Soc. Japan* 44, 68-77(1923).—Rice embryo was carefully freed from bran and broken rice, its purity being about 70-80%. The samples contain 10.41% H<sub>2</sub>O, 20.76% crude protein, 17.56% protein, 20.66% crude fat, 10.11% crude fiber, 27.82% sol. non-nitrogenous substance, and 10.24% crude ash. On hydrolysis, 100 parts of fat-free embryo gave 18.05 parts of arginine N, 5.85% histidine N, 5.41% lysine, and 0.46% cystine N. On the basis of pure protein freed from embryo by Rithausen's method, histidine content was 5.74%, lysine 0.68%, cystine 9.12, arginine 20.04%, and other N 54.44%. Two types of diets were used, 10% and 12% embryo protein being taken with various combinations. The results show that rice embryo protein has a high nutritive value, although the embryo alone is deficient in ash.

S. T.

Influence of heating and oxidation of the vitamin A and B of milk. HIDEABURO SEKINE AND TAMOTSU OKAMURA. *J. Chem. Soc. Japan* 44, 189-210(1923).—In order to prove S.'s statement (C. A. 14, 2813) that the nutritive defect of condensed milk is due to destruction of the vitamins S. and O. treated cow milk in 4 different ways and tested the nutritive value with 34 albino rats. Expts. were made on (1) raw milk, (2) milk boiled a few sec. over a Bunsen burner, (3) milk put, while boiling, into Koch's sterilizer for 40 min. and (4) same as 3 except the milk was stirred vigorously 4 times. In the boiled milk, pptd. PO<sub>4</sub> is carefully retained so that PO<sub>4</sub> deficiency may not confuse the result. When fed on (1) alone, the growth of the young was not very vigorous. They were, however, pregnant within 200 days, but could not rear the young. Milk (2) was almost as good as (1), while rats fed on (3) showed deficiency diseases of both A and B within a few days and died within a few weeks. Milk (4) showed greater defect than (3), some rats dying even as early as the 3rd day. Thus the nutritive defect of condensed milk is due to destruction of vitamin A and B.

S. TASHIRO

Proteins in *Fagopyrum esculentum* and their nutritive values. YOSHINIKO MARSUYAMA. *J. Chem. Soc. Japan* 44, 369-77(1923).—The chem. compn. of proteins of buckwheat, *Fagopyrum esculentum*, Moench, and their nutritive values are given. 100 parts of the decorticated wheat contains 13.04 H<sub>2</sub>O, 10.32 crude protein, 10.06 protein, 1.46 crude fat, 1.81 crude fiber, 71.51 sol. non-nitrogenous compds. and 1.86 crude ash. 46.84% of total N is H<sub>2</sub>O-sol., 22.10% sol. in 0.2% NaOH, 4.21% sol. in 10% NaCl. Protein sol. in 70% cold alc. is 24.21%, and that sol. in hot 60% alc. is 14.74. The

wheat is extd. with 0.2% NaOH (68.32% of total N, including H<sub>2</sub>O-sol. and alkali-sol.), and pptd. with AcOH, dried and hydrolyzed. These dried proteins contain: total N 15.11%, N sol. in 20% HCl 14.08%, N insol. in 20% HCl 1.15%, humin N 0.32%, amide N 1.47, phosphotungstic-acid-precipitable N 3.49. The distribution of amino acid N is arginine N 2.22% (6.90% as arginine), lysine N 0.62% (3.23% as lysine), histidine N 0.52% (1.92%), cystine N 0.15 (1.30%), amino N 1.49%, non-amino N 2.01, mono-amino N 8.80%, 0.68% as triptophan. Nutritive values of these proteins were tried with 4 albino rats, 10% this protein, 14% fat, 4% salts, and 72% carbohydrate being used. Exceedingly satisfactory growth was noted in all cases, which is not surprising considering the large content of diamino acids (12.05%) in them. S. T.

## ABNORMAL

Acetonuria of diabetes. R. S. HUBBARD AND S. T. NICHOLSON, JR. *J. Biol. Chem.* 53, 209-30 (1922).—Based on certain assumptions, a formula has been developed by means of which the mol. ratio of ketogenic to antiketogenic substances in the diet of diabetic patients may be calcd. From a study of a no. of cases, it has been found that acetone excretion varies inversely as the value of this ratio. The excretion of acetone is sometimes increased by the inclusion of additional fat in the diet, although the extra fat theoretically replaces fat which the patient had been drawing from his own reserves. J. C. S.

The rickets-producing effect of dried thyroid. EDWARD MELLANBY. *Proc. Physiol. Soc. J. Physiol.* 57, 1 (1922).—Rations that have some tendency to produce mild rickets in puppies are made more strongly rickets-producing by the addition of dried thyroid. J. F. LYMAN

The basal metabolism in vitamin-B starvation and in beriberi. S. OKADA, E. SAKURAI AND H. KAWISHIMA. *Japan Med. World* 3, 102-4 (1923).—In 7 out of 10 cases of vitamin-B starvation the basal metabolism was decreased, and rapidly resumed the normal value on administration of vitamin-B prepn. In cases of beriberi the basal metabolism was usually normal, with the exception of a few cases where a marked diminution developed with the disease. The diminution in the basal metabolism was accompanied by paralysis or atrophy. Beriberi is therefore not vitamin-B starvation. M. E. MAVER

Multiple dietary deficiencies and the development of experimental tuberculosis in guinea pigs. G. MOURIGUAND, PAUL MICHEL AND PAUL BERTOYE. *Compt. rend. soc. biol.* 85, 1043-5 (1923).—Diets contg. the antiscorbutic factor but deficient in fat-sol. vitamin, in mineral substances and amino acids have no sp. influence on the development of exptl. tuberculosis in guinea pigs. Occurrence of scurvy in guinea pigs receiving an antiscorbutic diet. *Ibid* 1045-6.—In 4 guinea pigs of a series of animals used for other purposes scurvy developed although they were given 5 cc. of lemon juice daily. This accidental result may have been due to the fact that these animals were on a generally deficient diet and had also developed tuberculosis, all of which may have predisposed them to the disease so that 5 cc. of the lemon juice proved insufficient for them. S. MORGULIS

Spontaneous rickets in rats. V. KERENCHESKY. *J. Path. Bact.* 26, 222-3 (1923).—The importance of Ca and of fat-sol. vitamin A was confirmed. J. T. M.

Nutrition in obesity. M. LABBÉ. *Presse med.* 31, 227-8 (1923).—A review of studies of basal metabolism in obesity. W. A. PERLZWEIG

Hydrocyanic acid intoxication as a method of investigating avitaminosis. W. R. HESS. *Arch. ges. Physiol. (Pflüger's)* 198, 433-9 (1923).—A discussion of the points of similarity, as well as the differences, between avitaminosis and HCN intoxication. G. H. S.

Comparison between CaCl<sub>2</sub> and other Ca salts as a stock feed (LOWE) 12.

## F—PHYSIOLOGY

ANDREW HUNTER

The physiology of smell. ANTONIO MARTINCALDERIN. *Siglo med.* 69, 365-7, 395-7; *Ber. ges. Physiol.* 14, 542-3; *Chem. Zentr.* 1923, I, 127-8.—The degree of sensitivity of smell for a compd. depends exclusively on its soly. in the aq. layer surrounding the olfactory cells and in the lipoids. The capacity for smell is strongest when the substance is very sol. in each, is strong if it is very sol. only in the lipoids, is less if it is sol. only in the H<sub>2</sub>O layer and is absent if insol. in both. This principle has certain exceptions. 0.7% NaOH soln. and castor oil were used as solvents in the expts. Castor oil was superior to olive oil in its solvent power in relation to the lipoids. C. C. DAVIS

**Placental transmission.** I. The calcium and magnesium content of fetal and maternal blood serum. L. J. BOGGERT AND E. D. PLASS. *J. Biol. Chem.* 56, 297-307 (1923).—Serums from blood drawn from the cord and from an arm vein of the mother at the time of delivery, in 23 cases, were analyzed for Ca by the method of Kramer and Tisdall (*C. A.* 15, 3857-8) and for Mg by a slight modification of that of Briggs (*C. A.* 16, 2701). The Ca content was considerably higher (av. 10.9 mg. per 100 cc.) in the blood of the fetus than in that of the mother (av. 9.1 mg.). The av. Mg content of maternal blood was 2.0 mg. per 100 cc.; in fetal blood it was 2.1 mg. II. The various phosphoric acid compounds in maternal and fetal serum. E. D. PLASS AND EDNA H. TOMPKINS. *Ibid.* 309-17.—The distribution of the P in serum was studied by Bloor's methods (*C. A.* 12, 2388) in 11 cases. The averages of the values obtained were: total  $H_3PO_4$ , maternal 58.3, fetal 34.1; lipid  $H_3PO_4$ , maternal 38.5, fetal 12.9; acid-sol.  $H_3PO_4$ , maternal 11.5, fetal 18.3; inorg.  $H_3PO_4$ , maternal 9.8, fetal 14.4; org. acid-sol.  $H_3PO_4$ , maternal 2.3, fetal 3.9 mg. per 100 cc. serum. These differences were observed in all samples. Cf. Hess and Matzner, *Proc. Soc. Exptl. Biol. & Med.* 20, 75(1922-3).

Fructose, glucose and galactose tolerance in dogs. J. MEYER-BOHANSKY. *J. Biol. Chem.* 56, 387-93(1923).—The administration of fructose to dogs produced less, and that of galactose, more hyperglucemia than did the use of glucose. The hyperglucemia after the ingestion of galactose was lessened if glucose was given at the same time. This is not believed to be due to a lowered rate of absorption for this effect was not so regularly obtained when fructose was added to the galactose. Although considerable quantities of reducing substances appeared in the urine, no positive tests for fructose were obtained and galactose was identified by the osazone and mucic acid tests in only 2 expts. It is believed that changed products and not the sugars themselves were excreted. Cf. Folin and Berglund, *C. A.* 16, 2159, Foster, *C. A.* 17, 1659, and Benedict and Osterberg, *C. A.* 17, 2130.

Chloride and conductivity determinations in plasma. H. C. GRAM AND A. NORGGAARD. *J. Biol. Chem.* 56, 429-38(1923); cf. *C. A.* 16, 959.—In 12 specimens of girardinized plasma from 7 normal persons, the NaCl content varied from 0.595 to 0.625, av. 0.613%, and the ratio of this to the NaCl equiv. of the cond. varied between 0.907 and 0.978, with an av. of 0.939. In some cases of pneumonia, tuberculosis and renal disease, low values for both NaCl and cond. were obtained but the ratio between them remained normal, or very nearly so. Detus. of Cl in the corpuscles showed that low plasma Cl, when found, was not due to migration of Cl into the corpuscles. Cf. following abstract.

Observations on the regulation of osmotic pressure (conductivity, chlorides, freezing point, and proteins of serum). H. C. GRAM. *J. Biol. Chem.* 56, 593-624(1923); cf. preceding abstr.—In 10 normal cases, the NaCl content (titrated) varied from 0.588 to 0.629, av. 0.604% and the NaCl equiv. of the cond. from 0.640 to 0.674, av. 0.657%. The ratio of one to the other varied from 0.90 to 0.94, av. 0.917. After correction for the protein content, 7.7-8.3, av. 8.05% (dtd. by refractometer), the NaCl equiv. of the cond. varied from 0.787 to 0.811, av. 0.799% and the ratio from 0.74 to 0.78, av. 0.755. In nephritis high, normal and low values for cond. were found. Most pneumonias and some other infections, most uremias and diabetics with high blood sugar showed a low cond. The other pathological sera, including those from diabetics with low blood sugar, showed a normal cond. The change from the normal was even less if the variations in depression due to variations in protein content are taken into consideration. The freezing point of normal sera varied from -0.555 to -0.570, av. -0.562°. Low values of osmotic pressure were found in pneumonia and some other infections, while high values occurred frequently in diabetics (with high blood sugar) and uremia. In diabetes with normal blood sugar, the osmotic pressure was normal. In nephritis both high and low values were found. Decrease of cond. in serum is due to primary decrease in salt content, with consequent low osmotic pressure in cases with simultaneous low NaCl intake and formation of exudates or transudates, as in pneumonia and edema on a NaCl-poor diet. It may also be due to a secondary decrease in salts to compensate for a high osmotic pressure caused by an increase of non-electrolytes (glucose, urea, bile) as in diabetes, uremia and jaundice. A true increase of cond. and of chlorides are found in some cases of nephritis but in others a high cond. may be associated with normal Cl content, in which case it appears to be due to a low protein content. In no case was the protein content increased so that an abnormally low cond. was obtained.

The function of the parathyroids. H. A. SALVESEN. *J. Biol. Chem.* 56, 443-56 (1923).—After parathyroidectomy, the level of Ca in the serum is raised for only a short

time by the injection of Ca salts. However, by such injections or by the feeding of Ca salts or of milk, the life of some animals can be indefinitely prolonged. In such animals there is only 6-7 mg. per 100 cc. of serum, to which the animal seems to have become adapted. If the administration of Ca is stopped, the serum Ca falls and tetany occurs. The protective action of milk is due to its Ca content; for milk that has been treated with  $\text{Na}_2\text{C}_2\text{O}_4$  in amt. not quite sufficient to combine with all the Ca, so as to leave no excess of  $\text{Na}_2\text{C}_2\text{O}_4$ , and then centrifuged to remove the  $\text{CaC}_2\text{O}_4$ , will not prevent the appearance of tetany. The low glucose tolerance of parathyroidectomized dogs is raised to the normal if, by forced Ca feeding, the Ca content of the serum is restored to normal. The inorganic P of the serum was increased after parathyroidectomy and was sometimes diminished by the ingestion of glucose.

I. GREENWALD

The relative concentration ratios of some constituents of the urine. Distribution between plasma and corpuscles and the conditions in the blood of urea, creatinine, inorganic phosphates and uric acid. S. W. F. UNDERHILL. *Brit. J. Exptl. Pathol.* 4, 87-91(1923).—Urea and creatinine are evenly distributed between plasma and corpuscle in the blood of the cat. After the injection of urea and creatinine into the blood stream the substances may be found equally distributed between plasma and corpuscles, or there may be a greater proportion in the plasma. After the injection of inorg. phosphate and uric acid a larger proportion is found in the plasma relative to the proportion present in the corpuscles.

HARRIET F. HOLMES

The influence of sugars and other substances on the toxic effects of insulin. E. C. NOBLE AND J. J. R. MACLEOD. *Am. J. Physiol.* 64, 547-60(1923).—The toxic effects of insulin (*C. A.* 17, 580) which are antidoted by dextrose are not definitely relieved by other sugars except mannose. Levulose, galactose and maltose may cause a slight temporary improvement; arabinose, xylose, sucrose and lactose have no apparent effect. Na lactate, glycerol and alkali have no effect. These expts. indicate that the sugars tried, other than mannose, cannot themselves relieve the toxic effects of insulin, nor can they be converted readily into dextrose.

J. F. LYMAN

Does adrenaline affect the metabolism of the surviving skeletal muscles of the frog? F. R. GRIFFITH, JR. *Am. J. Physiol.* 65, 15-29(1923).—Adrenaline has no effect upon the  $\text{CO}_2$  production of surviving frog muscles. A modified Osterhout app. (*C. A.* 13, 231) used in the expts. is described.

J. F. LYMAN

The respiratory exchange and alveolar air changes in man at high altitudes. E. C. SCHNEIDER. *Am. J. Physiol.* 65, 107-27(1923); cf. *C. A.* 16, 584.—At an altitude of 14,110 ft. there was no change in the resting metabolism of 2 subjects during the acclimatization period. In a third subject resting metabolism was increased about 15% during the first 48 hrs., after which there was a return to the low-altitude metabolism level. In 5 subjects physical exercise during the first days at the high altitude caused a higher rate of metabolism than was normal for the low altitude, with individual differences in the amt. of increase and in the time that the heightened metabolism persisted. Mountain sickness was most severe in the physically unfit and was associated with a low alveolar  $\text{O}_2$  tension. The change in alveolar  $\text{CO}_2$  tension during mountain sickness did not indicate an alkalosis of the blood at that time.

J. F. LYMAN

Effect on metabolism of breathing pure oxygen at a pressure of one atmosphere. A. L. MEYER. *Am. J. Physiol.* 65, 148-57(1923).—A modified Regnault-Reiset respiration app. was used in expts. on two birds (canaries). It is concluded that when canaries are exposed to pure  $\text{O}_2$  at a pressure of 1 atm. for periods varying from 15 to 30 mins. the metabolism undergoes no demonstrable change.

J. F. LYMAN

Variations of the blood sugar of the rabbit throughout the day and the effect of the subcutaneous injection of dextrose. G. S. EADIE. *Am. J. Physiol.* 63, 513-9(1923).—Venous blood from rabbits fed on oats diet has an av. dextrose content (Shaffer and Hartman method) of 116 mg. per 100 cc. of blood, with a probable error of 8.2 mg., 06% of the detns. falling within this range. A certain proportion of rabbits (about 50%) show a low blood sugar content between 1 and 3 p. m., followed by a return to the morning value. When 0.8 to 1 g. dextrose per kg. body wt. is injected subcutaneously there is a sharp rise in blood sugar, reaching an av. max. of 172 mg. in about 30 mins., returning to normal in about 3 hrs. and followed by a smaller secondary rise. When the subcutaneous dose is 1.6 to 2 g. dextrose per kg. body wt. the rise is much greater (av. to 228 mg.) but the variations in rise are also much greater. Max. is reached in about 30 mins. followed by a fall for 3 to 5 hrs., with a slight secondary rise and a return to normal in about 7 hrs.

J. F. LYMAN

The occurrence of citric acid in sweat. C. D. LEAKE. *Am. J. Physiol.* 63, 540-4(1923).—Samples of human sweat, collected during (1) exposure to heat and (2) exercise, were analyzed for citric acid by the method of Salant and Wise. Calcd. for 24 hrs., heat



sweat contains 72.8 mg. citric acid per day, and work sweat 60.7 mg. Human saliva does not contain citric acid. Human heat sweat is acid with a  $pH$  value of 8.67.

J. F. LYMAN

**Chlorine interchange between corpuscles and plasma.** LUCIEN DAUTERBANDE AND H. W. DAVIES. *J. Physiol.* 57, 36-46(1922).—The conclusion of previous workers that the addn. of  $CO_2$  to blood causes a transference of Cl from plasma to corpuscles was confirmed. Acids other than  $H_2CO_3$ , whether added to blood *in vitro* or produced *in vivo*, do not of themselves cause any Cl transference unless they be present in quantities sufficient to neutralize the whole "bicarbonate reserve." With const. presence of  $CO_2$ , reduction of oxyhemoglobin produces no Cl transference. During severe muscular work Cl transference may occur not only for the regulation of the blood alk., but also possibly to maintain the normal osmotic pressure in the plasma. J. F. L.

**The nature of the sugar in blood.** L. B. WINTER AND W. SMITH. *J. Physiol.* 57, 100-112(1922).—Protein-free filtrates were prepd. from blood by pptn. by the method of Folin and Wu, concn. *in vacuo* and extrn. of the residue with 85% EtOH. The rotatory power of these solns. was compared with the Cu-reducing power. It is concluded that the sugar, normal to the blood, is an unstable form of dextrose, possibly  $\gamma$ -dextrose. Dextrose and levulose taken *per os* could not be detected as such in the blood, their conversion into normal blood sugar apparently being rapid. The blood sugar in cases of severe diabetes mellitus appears to be of an abnormal nature, probably the  $\alpha,\beta$ -form of dextrose. An enzyme is postulated whereby the  $\alpha,\beta$  equil. form of dextrose is converted into  $\gamma$ -dextrose, this enzyme being absent or inactive in cases of diabetes.

J. F. LYMAN

**The influence of carbon dioxide on the interchange of ions between the corpuscles and the serum of the blood.** J. MELLANBY AND G. C. WOOD. *J. Physiol.* 57, 113-28 (1923).—Normal,  $CO_2$ -free and  $CO_2$ -sated. sheep bloods were compared as to: (1) relative vol. of corpuscles and serum, (2) ash of blood and serum, (3) total alkali of ash of blood and serum, (4) K, Cl and  $P_2O_5$  of the ash of blood and serum, (5) capacity of the serums from the 3 bloods to combine with  $CO_2$ . The increased vol. of the corpuscles of blood with increased  $CO_2$  content is a definite function of the time. This indicates that  $CO_2$  increases the no. of ions in the cell by the decompn. of some slightly ionized compd., and that the liberated ion slowly diffuses across the envelope of the red cell. Cations as well as anions move freely across the envelope of the red cell under the influence of  $CO_2$  and take an important part in the maintenance of the neutrality of the blood, and the transport of  $CO_2$ .  $CO_2$  is carried by the cells in the same way as in the serum, as  $NaHCO_3$ , and the hemoglobin of the red cells does not combine with  $CO_2$ . The large effects produced by  $CO_2$  on the distribution of Na and Cl between serum and corpuscles, compared with the small effect produced by it on the distribution of K, indicate that Na and Cl enter into a sp. chem. relation with some constituent of the red cell which is not shared by the other ions of the blood.

J. F. LYMAN

**Muscle activity. I. The static effort.** E. P. CATHCART, E. M. BEDALE AND G. McCALLUM. *J. Physiol.* 57, 161-74(1923).—The expts. of Lindhard (*C. A.* 15, 888) are criticized because of: (1) the short period of static effort, about 1 min., and (2) the marked fixation of the chest because of the type of effort. To obviate these difficulties, 3 types of static effort expts. were tried, *viz.*, continuous, intermittent and gradually increasing. Contrary to the results obtained by Lindhard, there was (1) no reduced  $O_2$  intake during the effort, (2) no marked increase in  $O_2$  intake after the cessation of effort, (3) but little alteration in the respiratory quotient. Changes in pulse and respiration rates and in the blood pressure during the effort were noted. In static fatigue another phenomenon of the fatigue induced by prolonged positive work exists. This is indicated because (1) static fatigue is definitely associated with pain and (2) tremor of the muscles employed comes on very rapidly and may last for many mins. up to, at least, 2 hrs. after static effort has ceased.

J. F. LYMAN

**The effect of concentration of the red blood corpuscles on the dissociation curve of blood.** J. BARCROFT AND K. UYENO. *J. Physiol.* 57, 200-2(1923).—Bloods which (1) had been largely freed from  $CO_2$  and (2) had been sated. with  $CO_2$  at a pressure of 250 mm. Hg were sepd. by centrifuging into portions relatively rich and poor, resp., in hemoglobin. The  $O_2$  dissoc. curves of the 4 samples thus obtained were detd. at a  $CO_2$  pressure of 25 mm. The results obtained are in general agreement with the view that if  $CO_2$  be withdrawn from shed blood Cl ions will migrate from the interior of the corpuscles into the plasma, but the bulk of the cations will remain in the corpuscles.

J. F. LYMAN

**The production of heat in certain muscles of the hedgehog.** W. HARTREE AND R. J. S. McDOWALL. *J. Physiol.* 57, 210-4(1923).—An analysis of the heat production

during and after the contraction of the slow-moving isolated muscles of the hedgehog has shown that, qual. and quant., the same phenomena occur as in frogs muscle (C. A. 15, 2494).

**The change in the nature of the blood sugar of diabetics caused by insulin.** W. D. FORRESTER, W. SMITH AND L. B. WINTER. *J. Physiol.* 57, 224-33 (1923).—Blood sugar in cases of human diabetes differs from the sugar of normal blood as shown by differences in the ratio Cu-reducing: polarimetric value. Treatment of diabetics with insulin induces a change toward the normal condition in the nature of the blood sugar. It is assumed that normal blood sugar is a mixt. of  $\alpha$ -,  $\beta$ - and  $\gamma$ -dextrose in a certain equil. (C. A. 14, 3098). A possible explanation of the action of insulin is that it causes a shifting of the equil. in the direction of  $\gamma$ -dextrose formation, and that the  $\gamma$ -dextrose can be utilized while the  $\alpha$ - and  $\beta$ -forms cannot be used. The following expt. seems to indicate that 2 factors are concerned in the formation of normal blood sugar: solns. of dextrose or levulose when incubated at 37° with very small amts. of insulin and liver ext. in a jacketed polarimeter tube have their rotations altered in a downward and upward direction, resp. The Cu-reducing power of the solns. remains unaltered. Boiled liver is inactive, whereas insulin is thermostable. Neither factor alone is capable of causing an appreciable alteration in the rotatory power of the sugar. J. F. LYMAN

**The influence of the nutritional condition of the animal on the hypoglycemia produced by insulin.** N. A. MCCORMICK, J. J. R. MACLEOD, E. C. NOBLE AND K. O'BRIEN. *J. Physiol.* 57, 234-52 (1923).—The effect of insulin on blood sugar in glycogen-rich and glycogen-poor rabbits was detd. For the assay of insulin the following precautions should be added to the previous method (C. A. 17, 580). (1) The animals should be withdrawn from food 24 hrs. preceding the test; (2) they should all be of very nearly the same wt.; (3) three animals should be used for each test; (4) blood sugar should be examd. in 1.5 and 3 hrs. following the injection. If one considers as one unit the amt. of insulin which is capable of reducing the blood sugar to the convulsive level (0.045%) within 3 hrs., and this is not reached by any one of the 3 animals, a second assay on another group of animals should be made with double the previous dose. If too much insulin is given in the first trial the assay must likewise be repeated, one-half or less of the previous dose being used. J. F. LYMAN

**The colloidal alkali reserve of the blood.** T. H. MILROY. *J. Physiol.* 57, 253-72 (1923).—The distribution of alkali between colloids and soln. in the blood was studied by removal of the colloids of the blood by means of ultrafiltration through collodion plates and noting the change in alky. produced by various treatments of the blood previous to filtration as laking, dialysis against 0.85% NaCl soln. and addition of boric acid-mannitol soln. The following alkalinities were found: medium of plasma 0.024 mol., disperse phase of plasma 0.01 mol., medium of laked blood 0.02 mol., disperse phase of laked blood 0.025 mol. After dialysis of laked blood against 0.85% NaCl soln., rather more base is fixed by the colloids than before. The distribution of the colloid base of the plasma and laked blood between the acid colloid groups and two foreign competing acids (cacodylic and boric) has been studied experimentally and theoretically. J. F. LYMAN

**Carbon dioxide partial pressure in body cavities and tissue spaces under various conditions.** J. A. CAMPBELL. *J. Physiol.* 57, 273-9 (1923).—The effects of exptl. acidosis, temp., exercise and forced breathing on the compn. of air injected into various body cavities and under the skin were detd. Changes in air injected under the skin give a ready means of examg. changes in CO<sub>2</sub> partial pressure within the body. J. F. LYMAN

**Creatine formation during tonic muscle contraction.** K. UYENO AND T. MITSUDA. *J. Physiol.* 57, 313-7 (1923).—The claspings muscles in male toads and frogs show an increased creatine content during coupling in the breeding season. In decrebrate rigidity creatine increases in the rigid (cats) muscle. J. F. LYMAN

**Creatine formation in frog muscles contracted by nicotine.** T. MITSUDA AND K. UYENO. *J. Physiol.* 57, 280-6 (1923).—Frog muscles caused to contract by treatment with nicotine showed an increase in creatine content over the untreated muscle from the opposite side of the body. The neural region of the muscle shows a greater increase in creatine than does the non-neural. J. F. LYMAN

**The modification of the action of insulin by pituitary extract and other substances.** J. H. BURN. *J. Physiol.* 57, 318-29 (1923).—Subcutaneous injections of ext. of posterior lobe of the pituitary gland, given simultaneously with injection of insulin, diminish or abolish the fall of blood sugar produced by the latter. While adrenaline opposes the action of insulin simply in virtue of its accelerating effect on the normal compensatory action of the liver, the antagonism of pituitary ext. for insulin is of a more direct and

sp. nature. This property is destroyed by treatment with *N* alkali in the cold. Other exts. such as anterior lobe of pituitary, spleen, thyroid, brain tissue and thymus do not produce this effect. Nor is it produced by histamine. The effect of a small dose of insulin is greatly increased by previous intravenous injection of ergotoxin.

J. F. LYMAN

**Diffusion of glucose in the organism.** A. CHAUFFARD, P. BRODIN, P. ZIZINE AND A. GRIGAUT. *Compt. rend. soc. biol.* 88, 1022-4(1923).—The sugar content of pleural fluid, which is always above that of the cerebrospinal fluid, is considerably less than that of the plasma. Ascitic fluid on the contrary contains almost as much sugar as the plasma. By studying the diffusion through serous membranes of the organism of urea, NaCl, uric acid (as Na urate), glucose and colloidal substances such as cholesterol, fat and proteins, glucose is found to occupy an intermediate position between the crystalloids and colloids in the matter of distribution.

S. MOROGLIS

**Reducing and oxidation power of saliva.** L. JUSTIN-BESANCON AND R. MONCEAUX. *Compt. rend. soc. biol.* 88, 1024-6(1923).—Two g. of saliva with 1 cc. of a 4% hydroquinone in physiol. serum are incubated at 37°; the time required for a brown coloration to appear gives a measure of the oxidizing power. The reduction power is measured by using 2 g. of saliva with 5 cc. of 0.5% NaHCO<sub>3</sub> to which 0.1 cc. of a 5% soln. of methylene blue has been added. Differences in the oxidation and reduction rate are claimed which are of diagnostic and prognostic value.

S. MOROGLIS

**Proteolytic activity of intestinal mucous membrane of a depancreatized dog, and the effect of adding minimal quantities of pancreatic juice.** E. AND L. HÉDON. *Compt. rend. soc. biol.* 88, 1062-5(1923).—The ext. of the intestinal mucosa of a dog which had been completely depancreatized previously is entirely inactive with casein and gelatin, though tests with peptone show that it contains a certain amt. of erepsin. Active digestion of casein or gelatin is, however, demonstrable as soon as a minute quantity of pancreatic juice is added to the mixt.

S. MOROGLIS

**Biological study of organic bases. I. The organic bases of normal human urine.** SHIGERU TODA. *J. Biochem. (Japan)* 2, 417-23(1923).—The normal urine of Japanese contains chiefly creatinine and methylguanidine. II. The organic bases in the extractives from vegetable and animal foodstuffs. *Ibid* 425-8.—Presence of choline in medusae *Rhopilema esculenta* is demonstrated. *Ibid* 429-32.—In the edible plant *Pteridium aquilinum* betaine and traces of choline were isolated together with 2 other bases of unknown nature with m. p. of 137° and 127°. *Ibid* 433-6.—The org. bases of plants are chiefly in the form of glycocholate-betaine with the exception of several plants (*Chrysanthemum*, *Citrus*, etc.), where a proline-betaine and stachydrine are found. In *Porphyra laciniata* T. also succeeded in isolating stachydrine.

S. MOROGLIS

**The lipid substances of the placenta during various periods of pregnancy with special regard to the quantitative relationships.** HANSUKU WATANABE. *J. Biochem. (Japan)* 2, 369-97(1923).—The dry powd. placenta extd. with warm alc.-ether yields a material of which the largest part is sol. in ether and a small insol. fraction. The former is again sep'd. into 2 fractions by means of acetone, an acetone-sol. and -insol. fraction. The latter, which is the phosphatide portion, forms about 30% of the total lipid substance; it is made up very largely of lecithin, only 0.1 of this being cephalin. The acetone-sol. fraction contains the fats, cholesterol and fatty acids. The cholesterol is present in the free and bound form; the ratio between the two is 1:2. The fatty acids are likewise either in the free or bound state, the ratio between these being 1:3.5. The neutral fats constitute 27% of all the lipid substance. The ether-insol. fraction, apart from salts and traces of protein, consists chiefly of an insol. phosphatide (sphingomyelin?) and of free glucoside (cerebroside?). In the course of pregnancy the amt. of lipid material per 100 g. dry substance continually diminishes while that of the neutral fat increases every month. Although the placenta is larger in the case of male offspring, the lipid content is apparently independent of the sex of the fetus. The mass of the placenta lipids increases from month to month, but per 100 g. of fetus the quantity gradually diminishes. The neutral fats, however, in this respect also show an increase. The lipids and the neutral fat must evidently play an entirely different role at the different stages of pregnancy. It is suggested that the higher lipid content of the placenta during early pregnancy is associated with the inner secretory function of the placenta which likewise diminishes with the progress of pregnancy.

S. MOROGLIS

**Autolysis of pancreatic juice.** KAZUO NAGAI. *J. Biochem. (Japan)* 2, 399-407(1923).—The juice was obtained by means of a pancreatic fistula. 100 cc. was measured into Erlenmeyer flasks and left at 38°. Samples were taken at the beginning, then after 1, 2, 3, 6, 9, 12 and 15 hrs.; these were deproteinized with 10% CCl<sub>3</sub>COOH and the

amino N was detd. by the Van Slyke method. The initial velocity of the autolysis varies with each individual sample, showing thus that it must depend upon the amt. of enzyme. This initial velocity is independent of the total amt. of protein present, but after 12 hrs. the total amt. of amino acid N depends on the total amt. of N. An increase in acidity causes a fall in the initial velocity, while an increase in alk. causes an increase initially but sooner or later the activity diminishes, probably owing to a destruction of the enzyme by the alkali. The autolysis slows down as time progresses and stops altogether after 3-4 days. S. MORGULIS

**Glucolytic action of the blood.** II. Experiments on warm-blooded animals with phosphor mixtures. KANSHI FUKUSHIMA. *J. Biochem. (Japan)* 2, 447-53(1923).—The glucolytic activity of the blood is at a max. within 3 hrs. after it is taken and diminishes with the progress of time. However, it can still be demonstrated even after 96 hrs. provided the medium contains enough phosphate. The addn. of picric acid at once destroys the glucolytic power and the sugar remains unaffected. III. Experiments with blood from cold-blooded animals using citrate mixtures. *Ibid* 455-60 (1923).—The glucolytic power of turtle blood is dependent on the enzyme concn. The optimum temp. for its activity is 15° and it is destroyed at 25°. S. MORGULIS

**The function of intragastric leucopedesis in the digestion of albumin.** M. LOEPER AND G. MARCHAL. *Progres Medical* 1923, No. 5, 50; *Bull. soc. hyg. aliment.* 11, 320 (1923).—Tests on a soln. of ovalbumin showed that in gastric juice (peptohydrochloric medium) leucocytes intensify the action of the secretion and their action is intensified by the latter. This action is spent after about 3 hrs., as the leucocytes themselves undergo peptohydrochloric digestion. Broth extd. from the stomach and deprived of leucocytes by filtration acts less energetically on albumins than unfiltered broth. Lactic acid and AcOH can activate pepsin like HCl, and also the leucocytic ext.; but the lacto-leucocytic mixt. is 2-3 times less active than a peptohydrochloric or leucohydrochloric soln. A. PAPINEAU-COUTURE

**Gastric leucopedesis after gastric ingestion.** M. LOEPER AND G. MARCHAL. *Progres Medical* 1923, No. 6, 62; *Bull. soc. hyg. aliment.* 11, 320(1923).—See C. A. 17, 1663. A. PAPINEAU-COUTURE

**Amyolytic action of the leucocytes brought into the stomach by leucopedesis.** M. LOEPER AND G. MARCHAL. *Progres Medical* 1923, No. 8, 86; *Bull. soc. hyg. aliment.* 11, 320(1923).—Acidity of the digestive juices interferes with the action of polynuclear leucocytes which are attracted into the stomach after ingestion of starch. The stomach also contains some saliva, but the duodenal reflux which accompanies absorption of starch also brings a little bile and pancreatic juice. Salivary enzymes and bile do not affect the leucocytes, but pancreatic juice increases their amyolytic action and is activated by them. A. PAPINEAU-COUTURE

**Action of certain irritants on gastric leucopedesis.** M. LOEPER AND G. MARCHAL. *Progres Medical* 1923, No. 12, 135; *Bull. soc. hyg. aliment.* 11, 321(1923).—See C. A. 17, 1663. A. PAPINEAU-COUTURE

**Gastric leucopedesis and oil.** M. LOEPER AND G. MARCHAL. *Progres Medical* 1923, No. 14, 160; *Bull. soc. hyg. aliment.* 11, 321(1923).—See C. A. 17, 1841. A. PAPINEAU-COUTURE

**The heat balance in inhabitants of the tropics.** H. W. KNIPPING. *Arch. Schiffs-Tropen-Hyg.* 27, 169-78(1923).—A calorimetric investigation of the heat balance of Europeans at home and of the same subjects when residing in the tropics, also of natives of the tropics failed to reveal any intrinsic differences between the metabolism or capacity for work, except such differences as can be properly accounted for by the factors of external temp. and humidity. W. A. PERLZWEIG

**The sugar of the spinal fluid and of the blood.** W. MESTREZAT. *Presse med.* 31, 157-8(1923).—Polemical with Polonovski and Dubot (cf. C. A. 17, 1829) and a defense of the existence of a normal average for the concn. of sugar in the cerebrospinal fluid of approx. 0.059%. W. A. PERLZWEIG

**The role of the hepatic cell in the elaboration and storage of protein.** R. NOEL. *Presse med.* 31, 158(1923).—A histological study proving that the liver cells of white rats on a protein diet store granules of protein, and that they are capable of elaborating protein when the animals are fed on fat or carbohydrate. W. A. PERLZWEIG

**The chemical heat regulation of mammals.** III. Heat regulation of white rats. KIKO GORO. *Biochem. Z.* 135, 107-21(1923); cf. C. A. 15, 1560.—The gas metabolism of fasting white rats was studied. With decreasing external temp. there is prompt chem. regulation of body temp. by adult rats. The crit. temp. is between 25° and 30°. Above this phys. regulation becomes effective but does not suffice to keep the temp. within normal limits. On the first day of starvation, the minimal energy ex-

change is 845-916, on the second day, 789-863 large cal. for 1 sq. m. body surface, or 133-142 and 125-131 cal., resp., for 1 kg. body wt. Temps. from 5° to 33° were studied. The rats were kept in the metabolism app. at each temp. for 7 to 8 hrs.

GEORGE ERIC SIMPSON

**The action of pyrotartaric acid and acetaldehyde toward yeast aerated with oxygen.** FRITZ LIEBEN. *Biochem. Z.* 135, 240-7(1923); *C. A.* 17, 1274.—The effect of aerated yeast on pyrotartaric acid as a possible intermediary in carbohydrate metabolism is studied. The acid is in large part decompd. with evolution of CO<sub>2</sub>, and is also used by the yeast in tissue formation. AcH, on the other hand, is only slightly decompd. It is therefore not to be regarded as an intermediary in the decompn. of lactic or pyrotartaric acid. Pyrotartaric acid was reduced with Zn dust and HCl and the resulting lactic acid detd. by the Fürth-Charness method with the use of a factor. G. E. S.

**The calcium content of the organs of cats treated with calcium.** W. HSUBNER AND P. RONA. *Biochem. Z.* 135, 248-81(1923).—The Ca content of various organs was detd. in a max. of 9 normal cats, of 6 "acutely" poisoned cats and of 4 "chronic" cats. The "acute" cats received 0.3-1.2 g. CaCl<sub>2</sub>·6H<sub>2</sub>O per kg. in several subcutaneous injections during 24 hrs.; the "chronic" cats a total of about 0.7 g. per kg. in 9-49 days. The original is to be consulted for the data, which are extensive. The variations in the Ca content of normal tissue are large (often 300%; in muscle 500%). Variations in the Ca:N ratio are also large. In this respect Ca differs from other cations which, even between different species, show only slight variations. When Ca is found in a tissue in an amt. considerably above the min., it may be regarded as present in 2 forms: (1) a biologically active form, comparable with other cations and (2) a biologically inactive or storage form, characteristic of Ca. Although relatively large amts. of Ca were injected and only a small amt. was excreted, there was, in general, no increase in the Ca over the normal limits. This indicates that the laying down of Ca in bone occurs rapidly. The Ca excreted in feces and urine was not usually detd. The amt. so disposed of could not have been large, in the "acute" animal at least. G. E. S.

## G—PATHOLOGY

H. GIDEON WELLS

**Observations and investigations of natural fetal immunity.** SALVATORE SCAGLIONE. *Fol. gynaecol.* 14, 339-61; *Chem. Zentr.* 1922, III, 67.—In the blood serum of the fetus are found complement, bacteriolytic amboceptors and opsonins. The amt. of antibodies is greater in the last months of intra-uterine life than in the early stages. Immunity is therefore acquired by the fetus and resistance to infection is greater in the last months than in the first. Though usually the antibody content of the maternal blood is greater than that of the fetus, the reverse case sometimes occurs.

C. C. DAVIS

**The relation existing between the histological state of transplanted segments of pancreas and glucosuria.** SABATO VISCO. *Arch. farm. sper.* 35, 154-60, 167-83(1923).—In 8 cases of transplanted pancreas 4 showed glucosuria and 4 did not. Histological examn. of the 4 without glucosuria showed acini intact, islands sometimes scarce and sometimes in normal quantity, abundant development of connective tissue, hyperemia and hemorrhagia. Of the 4 with glucosuria, 3 showed acini greatly altered, islands less numerous than normal though well preserved, marked development of connective tissue, hyperemia and hemorrhagia. These findings do not support either the acinous theory or the insular theory. It is suggested that the internal function of the pancreas regulating carbohydrate metabolism depends upon the organ as a whole. A. W. Dox.

**A study of the inorganic constituents of the blood in experimental nephritis.** W. DENIS. *J. Biol. Chem.* 56, 473-81(1923); cf. *C. A.* 17, 1665.—In U and CrO<sub>2</sub> nephritis in rabbits, there was no retention of any inorg. constituent when the non-protein N had reached about 90 mg. per 100 cc. and even when this had reached 200 mg. per 100 cc., the only inorg. constituent retained appeared to be inorg. sulfate.

I. GREENWALD

**The influence of pathological conditions upon the decomposition of adrenaline.** A. BALINT AND L. GOLDSCHMIDT. *Klin. Wochschr.* 1, 1510-1(1922).—The action of adrenaline is prolonged in infants afflicted with acidosis and reduced in fever. Adrenaline gives almost no rise in blood pressure when it is injected into a child that has been breathing rapidly for 15 min. Adrenaline is destroyed, *in vivo*, by a process of oxidation, which is most rapid in the presence of alkali. *In vitro* expts. are described that lead to the same conclusion.

MILTON HANKE

**The value of basal metabolism determinations in the diagnosis and treatment of**

**hyperthyroidism.** H. F. SROLL. *Boston Med. Surg. J.* 187, 127-33(1922).—Basal metabolism detns. prove helpful in borderline cases of hyperthyroidism. In conjunction with the usual clinical signs of toxicity the basal metabolism rate assists materially in deciding what form of therapy is most advisable. As changes in the metabolic rate frequently precede changes in the clinical picture, metabolism estns. at stated intervals afford a valuable means of checking any therapeutic measure, either medical or surgical. Deviations from the normal in basal metabolism rates are not always dependent upon diseases of the thyroid and for this reason a very careful history and painstaking examn. should always precede the basal metabolism detn. J. H. L.

**The blood in hepatogenous icterus.** ANTON FORTWÄGLER. *Centr. Inn. Med.* 44, 257-61(1923).—The marked polyglobulia observed in hepatogenous icterus goes parallel with a hypercholesterolemia so that a causal relationship is indicated. In different forms of hepatogenous icterus various combinations of bile constituents appear in the blood which indicate that an injury of the liver cells plays a more important role in the pathogenesis of this form of icterus than simple retention. JULIAN H. LEWIS

**The effect of temperature on velocity of reaction in hemolysis.** W. E. GOUWENS. *J. Infectious Diseases* 32, 421-32(1923).—Temp. has a 2-fold influence on hemolysis, just as it does on true enzyme reaction: (a) it hastens the reaction to its state of final equil., as in the case of most chem. reactions; (b) it has a retarding influence which increases as the temp. increases, owing to the destruction or inactivation of one of the reacting substances, complement. The optimum temp. for hemolysis lies between 40° and 45°, when a reaction running to 90 or 95% completion is considered. Even at 26° the inactivating effect of long-continued heating on complement is apparent. At higher temps. this effect becomes more noticeable, as shown by the earlier and sharper breaks in the reaction curves. Absorption of amoceptor by red blood cells is more than 90% complete during the 1st. min., even at 10°. Increase in temp. therefore has but little effect on this phase of the reaction. The "lag" which occurs in hemolysis immediately after the mixing of the reagents takes place in the lytic phase and not in the absorption phase. Complement is not firmly bound to amoceptor-erythrocyte complexes, and centrifugation of the mixts. leaves it in suspension. The action of complement on amoceptor-erythrocyte complexes is probably a surface phenomenon. Complement is completely inactivated in less than 10 mins. at 55°. This inactivation is over 75% complete in the first min. at 50°, and is over 50% complete in the first 5 min. JULIAN H. LEWIS

**Hydrogen-ion studies. VII. Hydrogen-ion concentration range of precipitin reaction (sheep serum).** E. F. HIRSCH. *J. Infectious Diseases* 32, 439-43(1923); cf. *C. A.* 16, 2732.—The H-ion concn. range of mixts. of sheep serum and homologous immune rabbit serum lies between  $p_H$  6 and  $p_H$  9.4. Max. pptn. occurs near the acid end of the range, i. e., near the isoelec. point of a protein pptg. from sheep serum at its isoelec. point. Sheep serum and homologous immune serum mixts. in a medium too alk. for pptn. will so react when the excess alkali has been neutralized by a small amt. of acid. JULIAN H. LEWIS

**The relationship of blood concentration to nitrogen retention in experimental nephritis.** F. P. UNDERHILL AND ROBERT KAPINOW. *J. Urology* 8, 307-16(1922).—There is a close relationship in U nephritis between the degree of retention of non-protein N and creatinine and blood concn., the greater the retention the more dil. becomes the blood. It is possible that changes in blood concn. may be employed clinically as an indication of the severity of a nephritic condition; and it is possible that this factor in part at least is responsible for the anemia observed clinically at times in nephritis. JULIAN H. LEWIS

**The appearance and significance of bactericidal substances in the blood during croupous pneumonia.** E. F. MÜLLER. *Z. Hyg.* 97, 20-43(1923).—During lobar pneumonia bactericidal substances appear in the blood in greater concn. than in the normal condition but the increase is not marked. This increase is only of minor significance in recovery because there is never an increase greater than that which appears on the 2nd day of illness. That recovery occurs in spite of a low and stationary bactericidal action of the blood is evidence that the action of sp. antiserum does not depend on its content of bactericidal substances. JULIAN H. LEWIS

**The importance of metallic salts in immunization and in particular in the production of diphtheria antitoxin and agglutinin for B. coli.** L. D. WALBUM AND J. R. MÖRCH. *Ann. inst. Pasteur* 37, 396-442(1923).— $MnCl_2$  and  $CoCl_2$  injected intravenously during the course of immunization against diphtheria toxin favor the production of antitoxin in goats and horses. Whereas antitoxin causes a negative phase immediately after injection,  $MnCl_2$  causes an immediate rise in the antitoxin value of the serum, which

reaches its max. in 1 hr. By mouth  $MnCl_2$  is without effect. The av. yield per yr. of antitoxin value of the serum of a horse immunized against diphtheria toxin is much increased if the immunization is carried out in conjunction with intravenous Mn treatment. The Mn injected disappears rapidly from the circulation, chiefly by way of the intestinal tract. Immunization alone, without Mn treatment, causes no changes in the Mn content of the organs, with the conspicuous exception of the liver, which may lose  $\frac{1}{2}$  of its Mn content in the course of immunization. When Mn is injected along with toxin, marked increase in the Mn content of the viscera occurs, proportional to the amt. injected. A parallelism is noted in the liver between its retention of Mn and the aptitude of the organism to produce antitoxin. Immunization against *B. coli*, with the production of agglutinin, is influenced by injection of metallic salts, which are effective somewhat in proportion to their atomic wt. The production of passive immunity is not affected by injection of metallic salts.

E. R. LONG

Role of antibodies in the immunity of caterpillars. S. METALNIKOV. *Ann. inst. Pasteur* 37, 528-36(1923); cf. C. A. 16, 128.—The caterpillars of *Galleria mellonella*, which possess an extraordinary resistance to massive doses of microbes, and which are easily immunized, are almost completely devoid of antibodies. The only discoverable antibodies in the blood of immunized caterpillars are bacteriolysins against the cholera vibrio and dysentery bacillus, which effect a rapid disintegration of the microorganisms to granules. In the great majority of infections bacteriolysins are not observed. The high defensive power of the organism against other bacteria is the result of very active phagocytosis in which giant cells play an important role.

E. R. LONG

Pathologic-anatomic studies on the question of hypertension and hyperglucemia. F. SCHWAB. *Arch. path. anat. (Virchow's)* 242, 1-13(1923).—Hypertension and hyperglucemia are not primary diseases, but are symptoms of a disturbance of the circulatory and metabolic systems. They are usually, but not necessarily, coordinated. In 42 cases of hypertension normal blood sugar values were found in 17. In 10 the blood sugar was at the upper limit of normality, and in 15 it was definitely above normal. The highest figure noted in hypertension without complication was 0.18%. The most important anatomic finding in hypertension was vascular changes in the pancreas.

E. R. LONG

Organic changes following the feeding of lanolin in rabbits. M. CHUMA. *Arch. path. anat. (Virchow's)* 242, 275-309(1923).—Prolonged feeding of lanolin to rabbits causes a hypercholesterolemia leading first to the appearance of pseudoxanthoma cells in the intima of the aorta, and later to necrosis of these and the formation of atheromatous nodules in which Ca is deposited. The picture is like that of atherosclerosis in man. The kidneys show a chronic parenchymatous nephritis, in which anisotropic lipid is deposited in the lumen and epithelial cells of the intact Henle loop. In the liver, anisotropic lipid lies in the hepatic cells around the central vein and later in the Kupffer cells. In the tongue and stomach papillomas and adenomas appear, but are not certainly to be attributed to the feeding. The adrenals increase to 3 times the normal size and show anisotropic fat in the zona reticularis and fascicularis. The pulmonary artery intima is thickened with pseudoxanthoma cells, and histiocytes laden with anisotropic fat are found under the pleura and in the lung septa. Similar cells are found in the alveoli in lanolin-fed rabbits with pneumonia. Occasionally necrosis occurs in the spleen, and the appearance of fat-laden cells in the sinuses is regular. The reticulo-endothelial cells of the bone marrow contain the doubly refractive lipid, the marrow becomes richer in fat and nodules of pseudoxanthomatous tissue form. Infiltration of xanthoma cells in the synovial membranes and joint capsule interferes with joint motility. After 100 days feeding a greyish white fatty substance is deposited along the junction of cornea and conjunctiva; the picture resembles the arcus senilis in man. Cryst. cholesterol esters are deposited in the iris, leading to thickening. The pressure may lead to glaucoma. The skin becomes yellowish, thick and nodular, resembling human skin in *xanthoma planum* and *tuberosum*. In the nodules pseudoxanthoma cells, giant cells, increased connective tissue, and cholesterol deposition are noted. There is marked atrophy of the sebaceous and sweat glands and a loss of elastic tissue. In castrated animals much more advanced changes of the same character as described occur. C. considers the above changes as effects of two types, the xanthomatous tissue formation, attributable to the hypercholesterolemia, and the degenerative changes in kidneys and stomach, which probably have no direct relation to the cholesterol feeding.

E. R. LONG

Histological study of muscle degeneration produced by local injections of insulin. D. J. BOWIE AND W. L. ROBINSON. *J. Lab. Clin. Med.* 8, 569-72(1923).—The pain and discomfort of insulin injection are probably due to the hypertonicity of the soln.

employed. Various hypertonic solns., such as hypertonic glucose, produce the same sort of degeneration of the muscle fibers and leucocytic invasion as insulin soln.

E. R. LONG

A study of the relation between the presence of indican and of uroscopigen in the urine in certain diseases. JACOB ROSENBLUM. *J. Lab. Clin. Med.* 8, 610-1 (1923).—There is no const. relation between the excretion of indican and that of uroscopigen. Occasionally in persistent indicanuria only a faint trace of uroscopigen is present.

E. R. LONG

Gastric analysis and the constancy of the percentile relationship among the titrable factors of the gastric secretion. B. S. LEVINE. *J. Lab. Clin. Med.* 8, 612-4 (1923).—A const. percentile relationship exists between the titrable factors of the gastric secretion normally. High or low values may be typical of individuals and be normal for those persons. Variations in the degree of acidity may occur on consecutive days with no pathol. gastric involvement. Three gastric analyses should be performed on successive days and the constancy of the percentile relationship of the titrable factors detd. before any conclusion concerning gastric pathology is made. In a number of pathol. cases this percentile relationship is disturbed.

E. R. LONG

A useful urinary finding in the diagnosis of hydronephrosis and pyonephrosis. JACOB ROSENBLUM. *J. Lab. Clin. Med.* 8, 621 (1923).—Fat globules were found in the urine in 3 cases of pyonephrosis and 2 cases of hydronephrosis. In one case in which the ureters were catheterized separately the fat droplets were found only in urine from the diseased side.

E. R. LONG

A slide precipitation test for syphilis. A. H. PRIESTLEY. *Lancet* 1923, I, 1260-2.—Serum and antigen are mixed as in the Sachs-Georgi test. The reaction is carried out with small amts. on a slide and flocculation observed.

E. R. LONG

A further study of a precipitation test for syphilis. C. Y. WANG AND R. A. BASTO. *Lancet* 1923, I, 1262-3.—96% agreement between the pptn. test for syphilis and the Wassermann test was obtained.

E. R. LONG

Antianaphylaxis and desensitization. W. T. LONGCOPE. *Physiol. Rev.* 3, 240-74 (1923).—A critical review with bibliography. Specific desensitization of both actively and passively sensitized guinea pigs is brought about by neutralization or exhaustion of sp. antibodies, probably situated within the cells. Serum disease appears to be dependent upon an antigen-antibody reaction. Sp. desensitization can be carried out in man in much the same manner, although not as effectively, as in animals, and probably follows the same laws. It is difficult to explain the desensitization of the spontaneously hypersensitive individual, as the mechanism of this type of allergy is not yet clearly understood. It is possible that non-sp. desensitization in which complex proteins, such as animal sera, are used for the sensitization, may depend upon a group reaction in which antibodies in the cells are satd. or exhausted by fractions of heterogeneous proteins employed.

E. R. LONG

Anhydremia. W. MCK. MARRIOTT. *Physiol. Rev.* 3, 275-94 (1923).—A review with extensive bibliography. The occurrence of anhydremia in clinical conditions, the compn. of the blood, the blood vol., the urine secretion, the heat regulating mechanism and metabolism in anhydremia, and the treatment of anhydremia are considered.

E. R. LONG

A simplified method of dextrose infusion with the addition of calcium. HELWIG. *Z. physik. diät. Therap.* 26, 41-3 (1923).—The treatment of patients with hypoglycemia by dextrose injection can be extended with profit to hypoglycemic patients suffering with arteriosclerosis and myocardial weakness, if Ca is added to the sugar. To each 10 cc. of 25% sugar soln. 1 cc. 10% KCl soln. is added.

E. R. LONG

The Ambard law of urea elimination. R. BAUER AND W. NYIRI. *Z. Urol.* 17, 257-63 (1923).—Polemic with Lühlin. The deviations from the law are the result of errors in technic.

E. R. LONG

Extraction of the antidiabetic substance (insulin) by perfusion of the pancreas. I. The influence of neutral or alkaline perfusates on the respiratory metabolism of depancreatized animals. J. R. MURLIN, H. D. CLOUGH AND A. M. STOKES. *Am. J. Physiol.* 64, 330-47 (1923).—Fresh pancreas (cat, dog and pig) was perfused with Ringer or Locke soln. contg. 0.2% NaHCO<sub>3</sub> and at times 0.5 or 1.0% dextrose. The perfusates were subsequently injected into diabetic (depancreatic) animals and the effect on the respiratory quotient was noted. In several instances there was a perceptible rise in the respiratory quotient after administering the pancreatic perfusate to the diabetic animal, indicating an increased oxidation of carbohydrate as a result of the treatment. A modified Jaquet respiration app. is described. II. Influence of acid perfusates upon the blood sugar, dextrose : nitrogen ratio and respiratory metabo-



lism of depancreatized dogs. J. R. MURLIN, H. D. CLOUGH, C. B. F. GIBBS AND N. C. STONE. *Ibid* 348-63.—Ringer fluid acidulated with HCl is more satisfactory for the extn. of insulin by perfusion of the fresh pancreas than the alk. Ringer soln. previously used. This is probably due to the destructive effect of the acid on the protease of the pancreas, thus protecting the insulin from destruction by hydrolysis. Sufficient concn. of the insulin is obtained, without further treatment of the material than neutralization, to show a sharp fall in both the blood sugar and the dextrose : N ratio in the urine of depancreatized dogs, following single injections subcutaneously. The respiratory quotient of diabetic dogs is raised from 0.69 to 0.81 or 0.85 following a liberal feeding of dextrose and a single injection of the pancreatic perfusate. A respiration app. combining the methods of Jaquet and of Tissot is described.

Calcium chloride acidosis. J. B. S. HALDANE AND J. M. LUCK. *J. Physiol.* 57, 301-6(1923).—In an expt. on man 85 g. CaCl<sub>2</sub> were taken in the course of 3 days. The Ca was excreted mainly in the feces as CaCO<sub>3</sub>; while the Cl was completely absorbed, the Cl replacing HCO<sub>3</sub> and causing acidosis. Alveolar CO<sub>2</sub> fell, while acid, NH<sub>3</sub> and phosphate excretion rose. There was a large loss of H<sub>2</sub>O, Na and K. The loss of Na and K cannot be due to antagonism between the alkalis and Ca since NH<sub>4</sub>Cl has no action similar to that of CaCl<sub>2</sub> in this respect.

Bence-Jones protein. R. UCHIDA. *Centr. J. Med.* (Japan) 20, No. 11(1922); *Japan Med. World* 3, 106(1923).—When Bence-Jones protein was injected into the exptl. animal, there occurred changes in the epithelial cells of the uriniferous tubules of the kidneys. This change was accompanied by an albuminuria, which was followed by the excretion of Bence-Jones protein. Therefore changes in the kidney are necessary for the excretion of this protein. This fact has been proved by causing exptl. nephrosis by K<sub>2</sub>CrO<sub>4</sub> or cantharidin, in which cases the excretion occurred immediately after the injection.

The passage of hemolysin, enzymes, and drugs, into the cerebrospinal fluid under normal and pathological conditions of animals. N. KIMURA. *Japan Med. World* 3, 67-71(1923).—Those substances which are normal constituents of the cerebrospinal fluid, such as diastase or glucose, can be passed from the blood into the spinal fluid. Hemolysin and drugs never pass normally from the blood into the spinal canal. The aseptic inflammation of the choroid plexus, which is caused by the introduction of normal horse serum or cobra venom, favors the passage of hemolysin from the blood into the cerebrospinal fluid.

The toxin of *B. influenzae* and adrenaline. Y. WATANABE. *J. Bact.* (Japan) No. 325(1922); *Japan Med. World* 3, 83(1923).—The sol. toxin of the influenza bacillus causes dyspnea, paralysis of the hind legs, and diarrhea in the rabbit. The toxin also increases the secretion of adrenaline, which protects against the toxin by stimulating the heart.

The pathogenesis of beriberi. T. OGATO, S. KAWAKITA, T. SUZUKI, S. KAGOSHIMA AND C. OKA. *Med. News* (Japan) No. 1107(1922); *Japan Med. World* 3, 106(1923).—The syndrome developing from the deprivation of vitamin B and that of beriberi seem very different from each other. The vitamin contents of the viscera of beriberi cases are not different from those of the normal viscera. In polished rice disease the nervous symptoms develop toward the end of the course of the disease, while in beriberi they develop earlier. Also, the blood pictures do not agree. In vitamin B deprivation there is always an anemia, with a numerical decrease, atrophy, and plasma cell degeneration of the lymphocytes. Therefore the pathogenesis of beriberi lies not in a deprivation of vitamin B in the tissues but in the toxin production of the intestinal bacteria.

Acidosis in beriberi. T. HAYASHI. *Med. News* (Japan) No. 1107(1922); *Japan Med. World* 3, 107(1923).—The bicarbonate concn. of the plasma in beriberi according to Van Slyke's method in 14 cases, excluding the cardiac form, varied from 0.692 to 0.317% in 14 cases. In 6 cases it was less than 0.5%. The values for normal blood were 0.708-0.535%. The urea and N contents of the blood were slightly higher than normal.

Effect of peptone shock on blood uric acid. L. HÉDON, CRISTOL AND NIKOLITCH. *Compt. rend. soc. biol.* 88, 1018-9(1923).—In the rabbit and in the dog peptone shock is associated with a very striking rise in the uric acid content, both free and combined, in the plasma and in the red cells. This rise is regarded independent of the leucopenia resulting from the peptone shock. Cf. *C. A.* 17, 2453.

Histochemical diagnosis of sarcomas. F. LADREYTT. *Compt. rend. soc. biol.* 88, 1026-7(1923).—The specificity of sarcomatous growths manifests itself in the high con-

tent of its cells in Fe, P, K and the low content of Ca. In histological sections these chem. characteristics can be shown by special reagents which give a more or less diffuse ppt., which is quite distinct from the fine perinuclear granular ppt. obtained in inflammatory processes. The K content is greater the more malignant the sarcoma; on the contrary, the fine granular ppt. of Ca is more abundant in cells which are affected by inflammatory hyperplasia.

S. MORGULIS

**Composition of urinary calculi.** H. NAKANO. *J. Biochem. (Japan)* 2, 437-45 (1923).—Cystine and Ca oxalate crystals are demonstrated.

S. MORGULIS

**Substances in pathological urines which affect surface tension.** MASAJI TAKEDA. *J. Biochem. (Japan)* 2, 479-93(1923).—Pathol. urine contains substances which lower the surface tension. T. undertook to det. the nature of these substances. The 24-hr. urine was either dild. to a const. vol. of 2 l. or to a const. sp. gr. of 1.010. The acidity was also adjusted with 0.1 N HCl and the surface tension measured with a stalagmometer delivering 49 drops of H<sub>2</sub>O at 15°. With increasing acidity the no. of drops of urine delivered increases gradually but when the reaction reaches about  $p_H$  4 there is a sudden increase in the no. of drops. The protection of a suspension of gum mastic from pptn. and the surface tension of the urine are more or less parallel, but the protective action is lost in dialyzed urines. The substances in the urine which lower the surface tension are practically always dialyzable. Substances which are pptd. with abs. alc., albumoses, peptones and oxyproteic acids have very slight activity in lowering surface tension, but Zn salts almost invariably bring down the substances which exert this activity. These substances can be extd. from the ppt. obtained with satn. with (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> by means of amyl alc. CHCl<sub>3</sub> also exts. them to a certain extent while ether does so only with great difficulty. A slight pptn. of these active substances can be obtained by satn. of the urine with NH<sub>4</sub>Cl or by adding alk. BaCl<sub>2</sub>. From these considerations it follows that the substances present in pathol. urines must be derivs. of urobilin, uroresin, uroerythrin, hematorporphyrin and bilirubin. In diabetic urines, however, a large activity is exerted by substances which are pptd. with abs. alc.

S. MORGULIS

**The relation of vitamin C to bacterial infection.** G. M. FINDLAY. *J. Path. Bact.* 26, 1-18(1923).—Definite lesions occur in the bone marrow of guinea pigs both in acute and chronic scurvy. Guinea pigs with chronic scurvy are less resistant to bacterial infection than control animals. This may be due to the degenerative changes which appear in the bone marrow and to a feeble leucoblastic reaction.

JOHN T. MYERS

**The complement fixation reaction in liver fluke (Fasciola hepatica) infection.** N. H. FAIRLEY AND F. E. WILLIAMS. *J. Path. Bact.* 26, 19-26(1923).—In fluke infections of sheep specific antibodies appear in the peripheral blood of the definitive host. Phenol-saline and alc. exts. of fresh flukes possess antigenic properties. The antigenic titer of different exts. will vary markedly.

JOHN T. MYERS

**The pathology of schistosomiasis (S. haematobium and S. mansoni) in the human subject.** H. R. DEW. *J. Path. Bact.* 26, 27-38(1923).—The worms secrete a toxin which stimulates an eosinophilia and produces a complement-fixing body.

J. T. M.

**A further stage in the pigmented fatty change occurring in cell degeneration, resulting in the production of deeply pigmented bodies.** E. EMRYS-ROBERTS AND H. A. HAIG. *J. Path. Bact.* 26, 46-52(1923).—In certain subacute septicemias and toxemias pigment is deposited at the periphery of fatty or lipoidal globules in degenerated cells. The granules may be a reduction product of lipochrome.

JOHN T. MYERS

**The desiccation of serum and other protein solutions with special reference to the reagents used in the Wassermann reaction.** P. HARTLEY, A. J. EAGLETON AND C. C. OKELL. *J. Path. Bact.* 26, 54-65(1923).—Serum and other reagents of bacteriological and immunological importance can be dried with little or no loss of specific properties. Complement must be dried quickly over fresh H<sub>2</sub>SO<sub>4</sub>.

JOHN T. MYERS

**The properties of dried complement with reference to its use in the Wassermann reaction.** C. H. BROWNING AND E. M. DUNLOP. *J. Path. Bact.* 26, 66-8(1923).—Complement dried by the method of Hartley, Eagleton, and Okell is a valuable reagent in the Wassermann reaction.

JOHN T. MYERS

**The serum constituents responsible for the Sachs-Georgi and Wassermann reactions.** T. J. MACKIE. *J. Path. Bact.* 26, 121-2(1923).—The H<sub>2</sub>CO<sub>3</sub>-insol. globulin fraction of serum contains most of the Wassermann antibodies. The H<sub>2</sub>CO<sub>3</sub>-sol. pseudoglobulin fraction contains the substances responsible for flocculation in the Sachs-Georgi reaction. Albumin is inactive for both reactions.

JOHN T. MYERS

**Immunity to antiplatelet serum.** S. P. BRUNSON. *J. Path. Bact.* 26, 178-88(1923).—The immunity produced in guinea pigs to antiplatelet serum by the injection of this serum is due to the rabbit-serum fraction of the platelet serum and not to the platelet antibody which it contains.

JOHN T. MYERS

The relationship of the autolysin and the Wassermann antibody in the serum of a paroxysmal hemoglobinuria. R. P. SMITH. *J. Path. Bact.* 26, 196-9(1923).—The removal of the greater part of the autolysin produced no diminution in the Wassermann antibody. JOHN T. MYERS

The influence of the removal of sexual glands on the skeletons of animals kept on normal or rickets-producing diets. V. KERENCHEVSKY. *J. Path. Bact.* 26, 207-21 (1923).—Thirty-two castrated rats and 22 controls were observed. No essential influence of castration on the skeleton of growing rats appeared on either a normal or a rickets-producing diet. JOHN T. MYERS

An examination of the blood gases and respiration, with reference to the cause of breathlessness and cyanosis. J. M. H. CAMPBELL, G. H. HUNT AND E. P. POULTON. *J. Path. Bact.* 26, 234-96(1923).—In control cases there is a fairly close agreement between alveolar and arterial  $\text{CO}_2$  pressure. In many cases of breathlessness the alveolar  $\text{CO}_2$  pressure is much below the arterial  $\text{CO}_2$  pressure. This is usually due probably to the fact that the subject cannot expire deeply, but in some cases there seems to be a real over-ventilation of the lungs without sufficient time for the alveolar and arterial  $\text{CO}_2$  pressures to be equalized. In other cases the exchange of gases is incomplete. The bronchial spasm is an important cause of breathlessness since it favors the accumulation of  $\text{CO}_2$  in the blood, as its rate of diffusion is slower than that of  $\text{O}_2$ . In anemia the vol. of  $\text{CO}_2$  in the whole blood is almost the same as in plasma, and in polycythemia the difference is about normal because of an increase of fixed acid in the blood. The buffer value is diminished in anemia and increased in polycythemia. In mitral stenosis the  $\text{CO}_2$ -fixing power of the plasma was very slightly below normal and there was little change in  $p_{\text{H}}$  or arterial  $\text{CO}_2$  pressure. In anemia the  $\text{CO}_2$ -fixing power was above normal with little change in  $p_{\text{H}}$  or buffer value. In polycythemia the  $\text{CO}_2$ -fixing power was low. The arterial  $\text{O}$  satn. is a very important factor in cyanosis but peripheral venous stasis must play a part. JOHN T. MYERS

The cholesterol content of the blood in anemia, and its relation to splenic function. WM. MACANAM AND CECILIA SHISKIN. *Quart. J. Med.* 16, 193-203(1923).—The cholesterol content of the blood plasma is diminished in both secondary and pernicious anemia. The decrease may not be striking unless the red-cell count is less than 50% of the normal. The corpuscles show a less marked cholesterol decrease. After removal of the spleen there is an increase of cholesterol in the plasma. JOHN T. MYERS

Variations in the threshold in renal glucosuria. GEORGE GRAHAM. *Quart. J. Med.* 16, 236-44(1923).—A new type of renal glucosuria is described, in which no sugar can be detected in the urine when the patient abstains from food for a short while, but sugar is excreted when carbohydrates are eaten. The sugar tolerance is normal. The patients form a link between normal people and distinct cases of renal glucosuria. JOHN T. MYERS

Observation with the hematocrit volume-color index. GEORGE BOSSHALE. *Quart. J. Med.* 16, 245-62(1923). JOHN T. MYERS

Precipitin test in the diagnosis of syphilis. V. H. MOON. *J. Am. Med. Assoc.* 80, 1502-5(1923).—The precipitin test performed by the ring method described by Herrold gives confusing results on turbid or lipemic serums. Antigen contg. 0.4% cholesterol occasionally gives a positive precipitin reaction with serums from non-syphilitic patients. The precipitin test under proper conditions is more sensitive than the Wassermann test, in that the serums from known syphilitics which give a negative Wassermann reaction will often give a positive precipitin reaction. Careful work must yet be done to det. the optimum conditions of performance to obtain a max. sensitivity with no false positives. So many variable factors enter into the manipulation of the antigen that, in order to secure reliable results, the test must be performed by serologists of experience. It is not a simple test to be used by physicians in practice or by unskilled lab. workers. L. W. RIGGS

The creatine content of muscle in anoxybiotic twitch. E. A. SPIEGEL AND A. LOW. *Biochem. Z.* 135, 122-27(1923).—Contraction of the gastrocnemius of the frog in Ringer-KCN soln. or in an atm. of  $\text{N}_2$  ( $\text{O}_2$  lacking) caused no change in creatine content. It has been shown that no changes in the products of protein metabolism occur in anoxybiotic contraction (C. A. 8, 2182), but that lactic acid is increased in amt. Therefore changes in carbohydrate rather than in protein metabolism are to be regarded as causally related to prolonged contraction. GEORGE ERIC SIMPSON

Hemolysis by alkali and alkaline earth salts under normal and pathological conditions. KURT BECKMANN. *Biochem. Z.* 135, 317-28(1923).—The results with normal bloods confirm the contention of Höber that hemolysis is detd. by the sp. effect of the ions and not chiefly by osmotic differences. In hemolyzing power:  $\text{Mg}, \text{Sr} < \text{Ba} < \text{Ca}$

Co <> Na <> Li <> Rb < K and SO<sub>4</sub> < NO<sub>3</sub> < Br <> Cl <> CNS < I. The sign <> indicates that the difference between members of the series is but slight. In certain pathol. conditions this order may be different. In some of these the difference is associated with changes in blood C<sub>H</sub>.

Analyses of bone-ash in war osteopathy. WILHELM LOLL. *Biochem. Z.* 135, 493-503(1923).—See C. A. 17, 2449.

Influence of the thyroid on some toxic glucemias. KURT HOLM and A. BORNSTEIN. *Biochem. Z.* 135, 532-5(1923).—In thyroidectomized dogs pilocarpine hyperglucemia is less easily produced than in normal dogs. As it has been shown that pilocarpine and suprarenal hyperglucemia are quite independent, it follows that after thyroidectomy the mobilization of glycogen by various nervous stimuli is impaired.

Renal function and metabolism in a case of diabetes insipidus. D. S. HACHEN. *Am. J. Med. Sci.* 165, 846-55(1923).—Pituitrin, injected intramuscularly, in a case of diabetes insipidus caused a decrease in the polyuria with an increase in the sp. gr. and in the percentages of salt and urea N. After pituitrin injection the elimination of phenolsulfonephthalein was increased. The concn. of urea N, uric acid, and sugar in the blood was almost doubled within 3 hrs. after the pituitrin injection. The effects of the pituitrin make their appearance almost immediately after the injection, reach a max. in 3 hrs., and persist for from 8 to 12 hrs.

Pathogenesis of nephritic edema. LEO POLLAK. *Arch. expil. Path. Pharm.* 97, 352-78(1923).—The transfer of certain salts foreign to the body from the blood to the peritoneal cavity is retarded in animals with U or Cr nephritis, while animals with cantharidin nephritis cannot be differentiated from normal animals in this respect. The reverse process, i. e., resorption from the peritoneal cavity, is likewise delayed in the U- and Cr-treated nephritic animals, but not in those treated with cantharidin. The cause must lie in alterations in the permeability of the capillary walls and must be directly related to the processes concerned in the development of edema. In normal animals Fe appears in the urine within 1-2 min. after the intravenous injection of Na<sub>2</sub>Fe(CN)<sub>6</sub>; in U animals it does not appear until after 10-18 min. Absorption of Fe from the body cavity is also delayed in U and Cr animals. The transfer of water, saline, or glucose from the circulation to the peritoneum is not markedly abnormal in the U animals. This observation that for some substances permeability is increased, for others decreased, shows that the process is very complicated and it negatives a simple physicochem. interpretation of the processes of edema formation. The interchange of material between capillary and lymph space is obviously a complex biol. process, in which the cells of the vessel wall on the one side and the tissue cells on the other are very actively concerned.

Acetonuria and alkalosis. O. PORCHS and H. LIPSCHÜTZ. *Arch. expil. Path. Pharm.* 97, 379-85(1923).—The deprivation of carbohydrate leads to an increased amt. of acetone within 24 hrs. if there is a simultaneous alkalosis. In a similar manner alkalosis induced by NaHCO<sub>3</sub> increases the tendency toward acetonuria brought about by deprivation of carbohydrate.

Nature of the so-called cow-milk idiosyncrasy in infants. D. HOLSTEIN. *Z. Kinderheilk.* 35, 38-50(1923).—Inorg. ions, particularly K, may play a role in the idiosyncrasy to cow milk exhibited by children.

Pathogenesis of periodic vomiting in children. GHRRT. *Z. Kinderheilk.* 35, 51-5(1923).—Periodic vomiting in children is not primarily a metabolic disturbance but is due rather to derangement of the vegetative nervous system. There is no disturbance in fat metabolism and carbohydrate removal is of significance only in the type of case with ketonemia.

Immunological relationships of cell constituents of pneumococcus. O. T. AVERY and M. HEIDELBERGER. *J. Exptl. Med.* 38, 81-5(1923).—The protein pptd. by ACOH from solns. of pneumococci shows chem. reactions characteristic of nucleoprotein and mucoid. As contrasted with the non-protein sol. sp. substance, the protein of pneumococcus exhibits species rather than the type specificity characteristic of the former.

Surface tension of serum. VI. The study of immune serum. Time-drop and initial value of surface tension. P. LIGONIZ DU NOÛY. *J. Exptl. Med.* 38, 87-92(1923); cf. C. A. 17, 2144.—The initial surface tension of serum or serum solns. is not affected systematically by the presence of antibodies in the serum. On the contrary the time drop in 2 hrs. is always increased, from 25 to 100%. It is extremely important in order to demonstrate these phenomena, that the greatest care be taken regarding the cleanness of the vessels and the purity of H<sub>2</sub>O and NaCl. It is equally important

to use a device capable of preventing the jarring and shaking of the liquid. The value of the time-drop of a normal, healthy serum is never higher than 10 dynes. Should it be higher, the serum must not be used for immunity expts. C. J. WEST

## H—PHARMACOLOGY

ALFRED N. RICHARDS

New investigations of the blood and the blood-producing organs in benzene poisoning. GIACOMO FONTANA. *Giorn. clin. med.* 2, 93-8; *Ber. ges. Physiol.* 12, 78-9; *Chem. Zentr.* 1922, III, 78.—The extreme leucopenia caused in rabbits by daily injections of 1 cc. of  $C_6H_6$  per kg. affects the neutrophils much more strongly than the lymphocytes. The erythrocytes do not decrease greatly, but the total no. of blood corpuscles diminish. The spleen becomes atrophic and the marrow of the femur gelatinous. Mononuclear cells and megacaryocytes predominate in the leucocytes. C. C. DAVIS

The leucocytic reaction in the blood after parenteral injection of trypsin and pancreatic juice. MICA. *Selschenoffruss. physiol. J.* 3, 41-3; *Ber. ges. Physiol.* 14, 515; *Chem. Zentr.* 1923, I, 122.—After the parenteral injection of active trypsin and activated pancreatic juice there occurs at first hypoleucocytosis, then marked hyperleucocytosis, but with boiled trypsin and non-activated pancreatic juice it occurs to a much less degree. Hyperleucocytosis is followed by a great decrease in the leucocyte count which continues until death. During hypoleucocytosis, various degenerate forms of polynuclear leucocytes are observed. Mononuclear and eosinophilic forms are met with in increasing percentage. After repeated injections myelocytes appear in the blood and the no. of large monocytes and transition forms constantly increase. - C. C. D.

The acidosis of ether anesthesia in the dog. C. D. LEAKE, ELIZABETH W. LEAKE AND A. E. KOEHLER. *J. Biol. Chem.* 56, 319-25 (1923).—"In prolonged  $Et_2O$  anesthesia in dogs, whether respiration is steadfastly diminished or increased, the  $p_H$  and alk. reserve ( $CO_2$ -capacity of arterial plasma) of blood fall markedly, while the ketone bodies show no significant change. In very short  $Et_2O$  anesthesia in dogs, in which hyper-ventilation takes place, the  $p_H$  and alk. reserve of blood fall, and the ketone bodies tend to rise. These tendencies are reversed 30 min. after the withdrawal of  $Et_2O$ , and 12 hrs. later the  $p_H$  and alk. reserve are slightly above normal values, and the ketone bodies below." Cf. following abstract. I. GREENWALD

The initial acidosis in anesthesia. G. E. CULLEN, J. H. AUSTIN, K. KORNBLUM AND H. W. ROBINSON. *J. Biol. Chem.* 56, 625-61 (1923).—Dogs were used in the expts. The larger part of the fall in alk. reserve ( $BHCO_3$  at  $p_H$  at which blood is drawn) that occurs with  $Et_2O$ ,  $CHCl_3$  and  $N_2O$  anesthesia occurs during the first few min. of the anesthesia. The fall is less with  $N_2O$  than with  $Et_2O$  or  $CHCl_3$  and may be equalled in degree and rate of development by using  $N_2$  instead of  $N_2O$ . Control expts. showed that the fall is not due to exertion, psychic disturbance and repeated bleedings. Anoxemia alone lowers the alk. reserve, but even when combined with exertion is not considered to be quite adequate to account for the observed effects in  $Et_2O$  and  $CHCl_3$  anesthesia. The immediate fall in  $p_H$  indicates that the condition is an uncompensated acidosis and not a compensated alkalosis. Cf. preceding abstract. I. GREENWALD

Treatment of auricular fibrillation by quinidine sulfate. J. G. EMANUEL. *Lancet* 1923, I, 1050-4.—In those cases of auricular fibrillation with cardiac failure in which the patient responds well to treatment with digitalis and rest, quinidine is a valuable coadjutor. In cardiac failure not due to fibrillation quinidine is of no value. It is a drug for altering an abnormal rhythm, not for treating cardiac failure. Although it restores sinus rhythm it does not prevent the recurrence of fibrillation. E. observed cases where rhythm and cardiac competency were maintained 12 months by the use of quinidine. Such minor symptoms as headache, nausea, vomiting and giddiness not infrequently occur during quinidine therapy. Rarely does anything more serious occur; epileptiform seizure and temporary hemiplegia have been observed. E. R. LONG

Effect of digestive enzymes on pituitary extract action. M. H. REES AND R. W. WHITEHEAD. *Am. J. Physiol.* 65, 90-100 (1923).—The action of pituitary exs. in increasing the tone of isolated uterine muscle is not lost when the exs. are digested with gastric, pancreatic or intestinal enzymes. Pituitrin introduced into the stomach with pylorus open, or into the duodenum may be absorbed (in 50 secs. to 2 mins.) as shown by increased uterine tone. Absorption from other parts of the alimentary tract does not appear to occur. J. T. LYMAN

The physiological assay of insulin based on its effects on the hyperglycemia following glucose injections and adrenaline. G. S. EADIE AND J. J. R. MACLEOD. *Am. J. Physiol.* 64, 285-96 (1923).—Two methods were attempted. (1) It was found by

expt. that the hyperglucemia in rabbits due to dextrose injections is affected by insulin both in degree and duration, the effect on the duration being more marked when insulin and dextrose are given together than on the rise when the dextrose is given 1 to 1.5 hrs. after. Insulin might be assayed, therefore, by measuring the extent and duration of the rise in blood sugar occurring after the injection of insulin and dextrose. The following unit is suggested: The amt. of insulin capable of preventing a rise of blood sugar to above the normal level of 0.115% within 30 mins. after the injection, subcutaneously, of 2 g. dextrose per kg. body wt., the insulin being injected 1 hr. prior to the dextrose. Lesser doses of insulin than 1 unit would cause greater rises, the extent of which would probably indicate the dosage. This point has not been investigated. (II) The rise in blood sugar produced in 2 hrs. by adrenaline ( $r$ ), administered 1.25 hrs. after insulin, is related in general to the dose of insulin ( $d$ ) by the empirical formula  $d(r)a = K$ , in which  $a$  and  $K$  are consts. having the values 0.62 and  $10^{+40}$ , resp. Owing to unavoidable biological variations of the animals this formula cannot be used for assaying insulin, unless a series of animals is used so there is no practical advantage over the method previously proposed (C. A. 17, 580).

J. F. LYMAN

The constancy of the ratio  $C_H: p_{CO_2} + v_{CO_2}$  in blood of varying hemoglobin content. RUTH E. CONWAY AND DORIS M. THOMAS. *Proc. Physiol. Soc., J. Physiol.* 57, ix(1922).—In the equation for blood,  $K = C_H(p_{CO_2} + v_{CO_2})$ , where  $C_H$  is the H-ion concn.,  $p_{CO_2}$  is the pressure of  $CO_2$  in mm., and  $v_{CO_2}$  is the vol. of combined  $CO_2$  in cc. %,  $K$  is reasonably const. for varying percentages of hemoglobin and for  $CO_2$  pressure between 30 and 36 mm. Above and below these limits of  $p_{CO_2}$  there is a definite variation in  $K$ .

J. F. LYMAN

A contribution to the chemical-pharmacodynamic relationships of atropine and homatropine. D. I. MACHT. *Arch. intern. pharmacodynamie* 27, 175-203(1922); cf. C. A. 16, 3709.—A comparative study of the pharmacol. properties of atropine and homatropine and their products of decompn. was made on the circulation, the eye, and all kinds of smooth muscle viscera. While small doses of atropine completely paralyze the vagus terminals in the heart, and through a loss of vagus inhibition this generally causes a rise in blood pressure, equiv. and even larger doses of homatropine fail to paralyze these vagus endings, and cause a fall in blood pressure owing to a marked vasodilatation. Homatropine as compared with atropine is a more powerful drug in respect to inhibition of contractions and lowering the tonus of smooth muscle preps. Of the components of atropine, neither tropine, tropic acid alone, nor a simple mixt. of their salts produces the characteristic effects of atropine on smooth muscle. Of the components of the homatropine mol. mandelic acid in the form of simple salts or esters produces the characteristic effects of homatropine on smooth muscle. Conclusion: It seems that the property of relaxing smooth muscle and especially of producing mydriasis resides chiefly in the mandelic component of the homatropine mol., and is probably produced through a direct action on the muscle cells.

W. A. PERLZWEIG

The action of atropine on intestine and urinary bladder. V. E. HENDERSON. *Arch. intern. pharmacodynamie* 27, 205-11(1922).—Atropine decreases bladder tonus and also abolishes the effect of pilocarpine, but even larger doses leave the contractility of bladder muscles unaffected. Wherever atropine acts it cannot affect the contractile substance. Atropine lowers the tonus of intestinal muscles, but it does not abolish the effect of nerve stimulation in producing increased rhythmic movements or peristalsis. The lower tonus, however, seems to affect the efficiency of the contractile movements.

W. A. PERLZWEIG

Blood reaction under morphine. C. D. LEAKE AND A. E. KOHLER. *Arch. intern. pharmacodynamie* 27, 221-9(1922).—The changes in the H-ion concn. of the arterial blood plasma, together with the slight indications of intracellular acidosis as evidenced by the vital staining reactions to carmine- $Li_2CO_3$ , and with the formation of acetone bodies, and the reduction in the alk. reserve, lead to the conclusion that morphine causes a condition of transitory uncompensated alkali deficit, with the dosage of 10 mg. morphine sulfate per kg. body weight of dog, given subcutaneously.

W. A. PERLZWEIG

Experiments with morphine. W. BURRIDGE. *Arch. intern. pharmacodynamie* 27, 231-8(1922).—From perfusion expts. on frog hearts B. deduces that the stimulating and depressing actions of morphine are mediated by different cardiac mechanisms and that the depression is due to an interference with the capacity of the affected tissue to react with electrolytes,  $K_2HPO_4$  being especially involved. As with cocaine also, those tissues primarily stimulated and depressed by morphine must have an inherently lesser capacity to adsorb Ca than those tissues which are stimulated and depressed later. The balance between chlorides and phosphates may also influence the results.

An interesting theoretical relationship of these results to the problem of drug-addiction is developed. W. A. PERLZWEIG

**Action of caffeine upon the frequency of the heart beat.** VITTORIO SUSANNA. *Arch. intern. pharmacodynamie* 27, 265-75(1922).—Small doses of caffeine, 1-28 mg. per kg. body weight, injected intravenously into dogs and doses of 1 : 40,000 applied to the isolated rabbit heart caused diminution in the frequency of the heart beat, while larger doses increased it. Small doses affect the bulbous center of the vagus and thus cause the diminution of the frequency, while larger doses strongly stimulate cardiac muscle fibers and cause the increased frequency. No action of caffeine upon the sympathetic endings could be demonstrated. W. A. PERLZWEIG

**Note on the alcohol problem.** W. BURRIDGE. *Arch. intern. pharmacodynamie* 27, 239-41(1922).—Excitability is mediated by two independent mechanisms through each of which it may be increased or decreased. An augmentation mediated through one mechanism may exist side by side with a depression mediated through the other. Alc. acts on excitability through both mechanisms, depressing through one and augmenting through the other, the two actions going on side by side. W. A. PERLZWEIG

**Observations on antagonisms of excitability.** W. BURRIDGE. *Arch. intern. pharmacodynamie* 27, 243-56(1922); cf. C. A. 16, 2922. W. A. PERLZWEIG

**Excessive loss of heat during the hyperthermia induced by methylene blue.** J. F. HEYMANS AND C. HEYMANS. *Arch. intern. pharmacodynamie* 27, 319-32(1922); cf. C. A. 17, 432.—The loss of heat in dogs during the hyperpyrexia produced by the intravenous injection of methylene blue was studied by means of Noyon's calorimeter. The loss of heat and CO<sub>2</sub> production increased with the rise in temp. No heat retention phase was observed. The max. is reached rapidly above 41°. At 39° the heat loss amounts to 2.5 cal. per hr. per kg., rising to 8.0 cal. at 41°, while the CO<sub>2</sub> elimination increases 3-4 times simultaneously. From 40-41° to 43-44° the heat loss, while neither at a max. nor at a const. rate, remains greatly elevated amounting to 5 to 6 cal. Above the temp. of 43-44° the heat loss diminishes along with the CO<sub>2</sub> elimination and the respiratory vol. indicating a decrease in the rate of oxidation as the temp. rises to 45° and death. The mechanism of the stimulating action of methylene blue upon the cellular metabolism is explained in the light of these expts. W. A. PERLZWEIG

**Shock and parasympathetic reactions.** J. GAUTRELET. *Compt. rend.* 176, 1185-7(1923).—Expts. with dogs by intravenous injections of thionine-nigrosine, with and without previous intravenous injections of peptone or of colloidal Ag, led to the following conclusions: The thionine-nigrosine complex causes a lowering of the blood pressure by excitation of the vaso-dilatator app. The absence of hypotension following an injection of nigrosine in an animal previously injected with peptone or colloidal Ag indicates a paralysis of the parasympathetic nervous system. It is thus permissible to associate the parasympathetic paralytic nature of the consecutive nervous reactions with shock, and to explain, at least in part by such a nervous process, the refractory period of anaphylaxis and the mechanism of tachypylaxis. L. W. RIGGS

**Mode of action of bismuth on the trypanosomes and on the spirillae.** C. LEVARNITZ AND S. NICOLAU. *Compt. rend.* 176, 1189-92(1923).—A mixt. of equal vols. of a 2% soln. of Na K tartrobismuthate and an ext. of rabbit liver, made by grinding the liver in isotonic saline soln. and centrifuging, was kept at 37° and either Nagana trypanosomes or *Spirillum gallinarum* was added in variable amts. A control was made by adding the organisms to a 1% soln. of the Bi compd. After 90 min. at 37° the organisms were at first immobile then dead, while in the control they remained perfectly mobile. The toxic deriv. of the Bi compd. is also set free by fragments of the liver and by the kidney, lung, mesenteric ganglion, suprarenal capsule, ovary, brain and muscle tissue of rabbits. Total blood, blood serum, egg white, egg yellow and yeast were inactive. Liver of fowl, guinea pig, horse, sheep and calf gave results similar to those obtained with rabbit liver. The toxic deriv. is named *bismoxyl*. It differs from the arsenicals in that the latter act *in vitro* on the trypanosomes alone, while *bismoxyl* destroys both trypanosomes and spirillae. Other Bi salts and even the finely divided metal show activity in the presence of liver ext., the sol. salts being the most active. The amt. of *bismoxyl* formed depends on the quantity of liver ext. and not on the concn. of Bi in the mixt. The protein of the cellular ext. appears to form a Bi-toxalbumin analogous to the As-toxalbumin from atoxyl. L. W. RIGGS

**A new series of hypnotics, the arylalcoylglycols.** M. TUFFENEAU AND H. DORLENCOURT. *Compt. rend.* 176, 1343-6(1923).—The hypnotic actions of phenylglycol and of the substituted derivs., dimethyl, methylethyl, diethyl, dipropyl, and dibutylphenylglycol, were tested with dogs and mice to the deep sleep stage, and with the

stickleback fish to the stage of complete immobility to mech. excitation within 5 to 8 min. The hypnotic power of these glycols toward the fish increases with the no. of C atoms in the mol., the soly. of the glycols being in inverse ratio to the no. of C atoms. With dogs and mice the hypnotic power increases with the no. of C atoms up to  $C_{11}$  or  $C_{12}$ , beyond which it tends to decrease. The hypnotic properties are due to the glycol grouping and they are reinforced by trisubstitution. The resp. positions of the substituted radicals are important, thus  $C_6H_4.CHOH.CO_2H : C_6H_4.C_2H_5$  is much less hypnotic than  $C_6H_4.CHOH.CO_2H : (C_2H_5)_2$ .

L. W. RIGGS

**Ethylene as a gas anesthetic.** A. B. LUCKHARDY AND J. B. CARTER. *J. Am. Med. Assoc.* 80, 1440-2(1923); cf. *C. A.* 17, 2006.—A summary is given of 106 surgical cases in which  $C_2H_4$  was used as the anesthetic. Of these cases 104 were decidedly successful, the remaining 2 were refractory cases in which surgical anesthesia could not be produced. The advantages of  $C_2H_4$  over  $N_2O$  or  $Et_2O$ , mentioned in the previous paper, were fully confirmed. Attention is called to the inflammable nature of  $C_2H_4$  and to its ability to form explosive mixts. with air.

L. W. RIGGS

**Administration of hypertonic salt solutions for the relief of intercranial pressure.** TEMPLE FAY. *J. Am. Med. Assoc.* 80, 1445-8(1923).— $MgSO_4$ , 90 g., dissolved in 175 cc. of warm  $H_2O$  and given by rectum with a soft rubber catheter and syringe, is the best method of administration, as the patient is saved the distress of active catharsis and, in cases of vomiting, the administration of the salt by mouth may increase emesis and the value of the drug be lost to the patient. The history of 31 cases shows that the administration of hypertonic solns.,  $MgSO_4$  or  $NaCl$  is of great value in reducing intercranial pressure, and thus modifying the symptoms which are otherwise masked by such pressure.

L. W. RIGGS

**The blood with deep Roentgen-ray therapy.** E. F. HIRSCH AND A. J. PETERSEN. *J. Am. Med. Assoc.* 80, 1505-7(1923).—A chem. study of the blood of patients subjected to Roentgen-ray treatment was made by detg. the  $p_H$ ,  $CO_2$ , urea N, total non-protein N, uric acid, creatinine and sugar before treatment and at 2-hr. and 24-hr. periods after treatment. No striking alteration was observed in the above-named constituents. There was, however, a disturbance of the acid-base equil. manifested immediately after treatment by an increase of the  $p_H$  concn. and sometimes by a slight lowering of the alkali reserve. In the blood 24 hrs. after treatment these relationships are reversed.

L. W. RIGGS

**Poisonous constituent in cholera stools.** E. W. GOODPASTURE. *Philippine J. Sci.* 22, 439-45(1923).—The watery-stools were filtered, the protein in the filtrate was pptd. by heat and acid and filtered out. This filtrate was then treated with alc. and the resulting ppt. was dissolved in water made slightly alk. with  $Na_2CO_3$ . This soln. upon intravenous injection in dogs produced violent symptoms resembling those of cholera. The analogous conditions of cholera to high intestinal obstruction and experimentally closed duodenal loops are compared.

L. W. RIGGS

**The action of thyroxin. I. The effect of thyroxin on the body weight and liver glycogen of white mice.** B. ROMEIS. *Biochem. Z.* 135, 85-106(1923); cf. *C. A.* 17, 2154.—The results are in general agreement with those previously obtained by others. Subcutaneous injections of 0.005-0.02 mg. each were given daily for periods of 10 or 20 days. While 0.2 mg. in a single dose produces no effect, distributed in smaller doses a decrease in body wt. is produced. Diiodotyrosine in comparable dosage causes no change in wt.

GEORGE ERIC SIMPSON

**The biological determination of substances toxic to cells and seeds. III. Quinine.** T. HISHIKAWA. *Biochem. Z.* 135, 576-80(1923); cf. *C. A.* 15, 244.—Quinine-HCl in 1:2,000,000 diln. prevents the usual decolorization of methylene blue by pneumococcus cultures. Sensitivity of the cultures is greatly increased by keeping them in the refrigerator for a time. Various cultures differ greatly in sensitivity.

GEORGE ERIC SIMPSON

**Prevention of the inflammatory reaction after the intramuscular injection of neoarsphenamine.** PAUL FREUD. *Arch. expil. Path. Pharm.* 97, 54-60(1923).—Colloids, such as gum arabic, protect arsphenamine from the decomposing or pptg. action of an added anesthetic. The power and duration of the protection increase with the concn. of the gum. No inflammatory reaction follows the injection of neoarsphenamine if an anesthetic and gum are added.

G. H. S.

**Bile secretion.** ERNST NEUBAUER. *Arch. expil. Path. Pharm.* 97, 344-51(1923); cf. *C. A.* 16, 4260.—The pptn. of bile by  $CaCl_2$  and by acid is inhibited by the intravenous injection of a soln. composed of equal parts of cholic and desoxycholic acids. Desoxycholic acid increases the titration alkyl. of bile with methyl red as well as the amt.



of acid necessary to obtain pptn. Cholic and dehydrocholic acids do not modify these reactions. G. H. S.

Action of digitalis and atropine upon the frog heart at different temperatures. E. ROST. *Arch. expil. Path. Pharm.* 97, 386-402(1923).—Just as there is a different optimum temp. for different periods of the year as regards the action of digitalis upon the frog heart, so also does the temp. at which the frogs are kept modify the action of the drug. The effects of temp. are sufficiently great to be of significance in the standardization of digitalis or in performing exact quant. pharmacol. expts. G. H. S.

Pharmacological modification of kidney function. JULIUS SCHÜTZ. *Arch. expil. Path. Pharm.* 97, 403-8(1923).—In water diuresis the relative increase in water elimination is much greater than the increase in the elimination of solid components, particularly NaCl. In caffeine diuresis, while the water excretion is still greater, relatively, than the excretion of solids, the difference between the two—water and NaCl—is less marked. G. H. S.

Action of strychnine on Crustacea. I. Action on the claws of *Cancer pagurus*. E. STERNSCHEIN. *Arch. expil. Path. Pharm.* 97, 409-20(1923).—Treatment with strychnine modifies the curve of muscular contraction resulting from faradic stimulation. The curve shows no irregularities and no periods of relaxation between the stimuli. G. H. S.

Effect of ether narcosis upon the capacity of bees to return to their hive. LOTHAR TIRALA. *Arch. expil. Path. Pharm.* 97, 433-40(1923).—Ether narcosis, in the first few days after swarming, interferes with the ability of bees to return to their hive. G. H. S.

Effect of radioactive elements and hormones on vasomotor irritability. K. T. A. HALBERTSMA. *Arch. ges. Physiol.* (Pflüger's) 197, 611-23(1923).—Perfusion of frogs with K-free Ringer soln. to which a U salt is added (a larger amt. is required in winter) results in an inhibition of the irritability of the vasomotor nerves. Irritability is restored by the addn. of suitable amts. of a radioactive salt to such a perfusion fluid. When, however, substances yielding both  $\alpha$ - and  $\beta$ -rays are added in the proper proportions the irritability is again lost, but with a derangement in this equil. there results a return of susceptibility to stimulation. Adrenaline, histamine, or choline, added to such a balanced mixt., restores the irritability. G. H. S.

Immunity of the toad heart to digitalis. B. v. ISSEKUTZ. *Arch. ges. Physiol.* (Pflüger's) 198, 429-38(1923).—The toad heart is some 20 to 50 times less sensitive to digitalis glucosides than is the frog heart. As regards Ca the hearts of the 2 animals show no such difference. There is the same relationship between the actions of Ca and digitalis in the toad heart as in that of the frog. Absorption expts. show that the toad heart does not remove more active principle from a concd. soln. of glucoside than does the frog heart from a soln. 20 to 50 times more dil. Thus, the immunity of the toad heart is associated with a diminished permeability. G. H. S.

Effect of phosphorus intoxication upon the temporal bone. ALFONSO TRIMARCHI. *Arch. Ohren-, Nasen-, u. Kehlkopfheilk.* 109, 160-74(1922).—P intoxication in guinea pigs and rats led to circulatory disturbances, but aside from a slight proliferation of the periosteum there were no marked alterations in the bones. G. H. S.

Action of formic acid upon the skin. Experimental urticaria. A. KELLERMANN. *Dermatol. Z.* 36, 345-50(1922).—Urticaria could not be produced by the intracutaneous or intravenous injection of formic acid. Although it is apparently the formic acid which causes the pain and reaction following the bites of insects, the acid injected exptly. is not particularly painful and leads to a slight transitory local infiltration. G. H. S.

Calcium corrosion of the cornea. GEORG BRAUN AND FELIX HAUDROWITZ. *Klin. Monatsbl. Augenheilk.* 70, 157-65(1923).—The typical opacity results from the action of the alk. earth ions in alk. reaction, but not from Mg. The injured cornea shows neither the carbonate nor the phosphate of Ca, but the Ca combines with the collagen of the cornea. This compd. does not interfere with the transparency of the cornea. The corneal mucoid is involved in the Ca corrosion, since it is pptd. by the Ca, a reaction which is irreversible and which causes the mucoid to lose its soly. in water and NH<sub>3</sub>. The Ca which is pptd. in such a form is gradually resorbed (in rabbits the Ca content of the cornea reaches normal after 4 weeks). Dil. mineral acids readily clear the Ca opacity when experimentally produced; organic acids and NaOH are less effective in removing the opacity, and it is unaffected by NH<sub>3</sub>, NH<sub>4</sub> lactate or tartrate, or enzyme solns. Histologically recognizable Ca can be demonstrated in the lesions, and the deposition of Ca alters the chem. properties of the mucoid. G. H. S.

## I—ZOOLOGY

R. A. GORTNER

The effect of potassium cyanide on metabolism in two fresh water arthropods. W. C. ALLER. *Am. J. Physiol.* 63, 490-502(1923).—Exposure of may-fly nymphs to KCN decreases the rate of  $\text{CO}_2$  production, as compared with similar non-treated individuals. KCN decreased markedly the  $\text{O}_2$  consumption of the common isopod, *Asellus communis*. These facts give further support to the view that KCN depresses general metabolism.

J. F. LYMAN

The influence of hydrogen-ion concentration on the fertilization and growth of certain marine eggs. G. H. A. CLOWES AND H. W. SMITH. *Am. J. Physiol.* 64, 144-59 (1923); cf. *C. A.* 16, 3689.—Since it was observed that star fish (*Asterias Forbesii*) and sea-urchin (*Arbacia punctulata*) eggs, fertilized in normal sea water and immediately transferred to  $\text{CO}_2$ -free sea water of H-ion concn. between  $p_H$  8.2 and 5.8 or 5.2, develop at approx. normal rates to the 8- or 16-cell stage, it was possible to observe the influence of  $p_H$  on the fertilization process itself by noting the incidence of polyspermic and normally fertilized eggs when insemination and early growth took place in  $\text{CO}_2$ -free sea water of varying acidity. It was found that the mechanism controlling the permeability of the egg to sperm is a function of the H-ion concn. of the medium in which fertilization takes place.  $\text{CO}_2$  has no sp. effect on the (cortical or external) fertilization process apart from the increase in  $p_H$  occasioned by its presence; it does, however, have a very marked inhibitory effect upon the (internal) processes involved in segmentation and development.

J. F. LYMAN

## 12—FOODS

W. D. BIGELOW AND A. E. STEVENSON

Development of paratyphoid-enteritidis group in various foodstuffs. S. A. KOSER. *J. Infectious Diseases* 31, 79-88(1922).—The aim of the present investigation has been to gain some idea of the ability of several type strains of the paratyphoid-enteritidis group to develop in miscellaneous foodstuffs, such as various vegetables, fruits, meats, and evapd. milk. The effects of different conditions, such as temp. of incubation, the H-ion concn. and the texture of the food, were considered in relation to multiplication and the ability to spread throughout the foodstuff. All the strains of the Gaertner group multiplied readily in the liquor of several common cooked vegetables, with the exception of the highly acid sauerkraut. In the fruit juices a rapid destruction of the organisms occurred. In several meat products Gaertner group organisms exhibited a marked ability to spread from one original point of inoculation throughout the foodstuff, although this occurred only under optimum temp. conditions. The development of the Gaertner group in foodstuffs is usually not accompanied by visible alteration or spoilage. The present observations on this point are in accord with the reports of previous outbreaks of "food poisoning" caused by this group of organisms.

JULIAN H. LEWIS

Food colorings. F. W. RICHARDSON. *J. Soc. Dyers Colourists* 39, 148-9(1923).—Before the advent of synthetic dyes many poisonous Pb salts and pigments were used as food colors, although litmus, indigo, sap green, cochineal, gamboge, tumeric and saffron were available. Ultramarine blue, violet and green, Fe oxide brown and Mn brown are still used. Dyes contg. the nitro and nitroso groups are generally considered toxic. Et, Am and isobutyl nitrites cause paralysis of the vasomotor nerves and dilation of the blood vessels. The carboxyl radical diminishes toxicity and salicylic acid is less poisonous than phenol. The following are considered non-toxic: tartrazine, curcumin S, naphthol yellow S, naphthol red S, chloramine red B, carmoisine, ponceau 2R, fast scarlet BC, rhodamine B, eosin, erythrosine B and D, xylene blue BS, gentian blue 6B, and blues from diphenylamine, Et green, malachite greens, emerald green, fast green, fast green J and O, new green, new Victoria green, benzaldehyde green, diamond green and chrysamine R. The following are regarded as poisonous: aurantia, Martius yellow, picric acid, Me violet 6B and Victoria green. CHAS. E. MULLIN

Contributions to our knowledge of leaven fermentation. ERICH BECCARD. *Centr. Bakt. Parasitenk.*, II Abt. 54, 465-71(1921).—On a medium composed of bran ext. sterilized by filtration, 2 strains of acid-forming bacteria were isolated. These organisms were capable of producing volatile and non-volatile acids and alc. In baking tests in which they were employed a bread was produced corresponding in every respect to leavened bread. Conclusion: Yeasts are not essential on the leavening of bread, al-

though they are usually present and presumably involved in the process.

Relation of the cereal chemist to the baking industry. JULIAN H. LEWIS  
E. B. CLARK. *J. Am. Assoc. Cereal Chemists* 8, 94-9 (1923).

The chemical engineer in bakery management. G. L. MONTGOMERY AND A. G. WIKOFF. *Chem. Met. Eng.* 29, 12-5 (1923).

Manioc bread. G. A. GUABRADO. *Sanidad y Beneficiencia* 27, 145-6 (1922); *Bull. Agr. Intelligence* 13, 1281-2.—Manioc ("yuca") grows wild in Cuba, where it resists the most severe drought. Manioc bread, externally, looks very much like that made from wheat, but, on account of lack of gluten, it is not so soft. It is slightly bitter but the taste is pleasant. The following analyses are given for manioc bread and wheaten bread, resp.: moisture 26.00, 29.31; protein ( $N \times 6.25$ ) 11.25, 13.45; starch and reducing sugars 49.11, 54.42; fats 8.60, 1.18; cellulose 4.00, 0.63; ash 1.04, 1.00;  $P_2O_5$  in the ash 0.074, —; acidity calcd. as AcOH 0.40, 1.40%; cal. per kg. of dry matter calcd. according to the metabolic formula 4666, 4081. The figures given for the wheaten bread represent the av. of 5 yrs. analyses.

Juice of citrus fruits and its more systematic commercial utilization. A. PURRI. *Boll. sci. tecn. periodico bimestrale per gli A. i del comitato nazionale sci. tecn. per lo sviluppo l'incremento dell'industria ital.* 3, No. 2, 72-3; *Bull. Agr. Intelligence* 12, 1193-4 (1922).—The best method of keeping the fresh juice in a condition suitable for export is to concentrate it under vacuum at temps. not above  $50^\circ$  to  $60^\circ$  when an ext. representing  $1/4$  to  $1/10$  of the juice is produced. In the com. prepn. of the juice the old methods must be abandoned and the superficial colored external portion, contg. the essential oil, removed alone and the juice extd. with a special app. consisting of rotating glass lemon squeezers. It is filtered through knitted cloth in a stone ware centrifugal filter and kept in stoneware vessels.

Report on dairy products. JULIUS HORTVET. *J. Assoc. Official Agr. Chem.* 6, 422-9 (1923).—The text of the cryoscopic method (C. A. 15, 1359) has been rewritten, no essential details being altered. It is recommended that it be adopted as an official method of the association. (Cf. C. A. 16, 3139.)

A study of the factors that influence the coagulation of milk in the alcohol test. H. H. SOMMER AND T. H. BINNY. *J. Dairy Sci.* 6, 176-97 (1923).—Solns. of various milk salts, 0.25 M, were added to milk in varying amts. and the effect on the alc. test is shown.  $Ca(OAc)_2$  (0.2 cc.) and 0.1 cc.  $MgCl_2$  when added to 25 cc. of fresh milk cause a positive test. As high as 0.9 cc.  $KCl$ ,  $K_2HPO_4$ , and Na citrate failed to give a positive test. The effect of Ca and Mg is counteracted by the citrates and phosphates. By feeding expts. with 3 cows it is shown that addn. of  $CaCO_3$  in amts. ranging from 50 to 200 g. daily to the ration caused the milk to become more and more positive. Increasing amts. of  $K_2HPO_4$  were required to counteract it. No appreciable increase in total amt. of CaO in the milk was shown by analysis. Acidity affects the alc. test and the effect of acidity and salts is additive, 0.007% CaO being equiv. to an increase of 0.06%, and 0.0088%  $P_2O_5$  equiv. to a decrease of 0.04% in acidity. The effect of milk salts easily accounts for any lack of correlation between the alc. test, acidity and bacterial counts. (Cf. C. A. 9, 2555; 15, 2516.) Rennet produced changes in milk which caused a positive test, the amt. of rennet and time of action being detg. factors. Rennet-forming organisms are considered a minor factor. A discussion as to the effectiveness and justice of the application of the test is given.

The cryoscopy of milk. E. M. BAILEY. *J. Assoc. Official Agr. Chem.* 6, 429-34 (1923).—As a result of the study of the influence of acidity on the f. p. it was recommended that no correction be applied if the acidity does not exceed 0.25%. The effect of increased acidity is an additive factor and the magnitude of the depression closely approximates 0.003 for each 0.01% increase in acidity. The f. p. of milk from tubercular cows was detd. Six Jersey cows were used. No figures outside the suggested figures for normal milk were obtained. Results are tabulated. Examm. was made of 40 samples of milk from a herd from which some abnormal samples had been obtained as shown in the 1921 report (cf. C. A. 16, 3139). Only one f. p. outside the limits was found.

The practical importance for the sanitary control of milk, of the Skar method of determining the number of bacteria. FR. SCHNEIDER. *Milchw. Zentr.* 52, 25-30 (1923).—The method of Skar (C. A. 7, 2954) is compared with the plate method. A table shows results obtained by the two methods, ordinary agar and serum agar being used for the plate method. The Skar method in general gives a higher count and a more accurate estn. of the number of bacteria present.

The influence of several agents in the preservation of milk. JOS. PROKS. *Zprawy*

*lactologického ces ústavu českého vysokého učení technického V. Praze*, 13, 8\*, 40 pp. (1920); *Centr. Bakt. Parasitenk.*, II Abt. 54, 129-31 (1921).—The action of  $\text{NaHCO}_3$ , Na benzoate, microbine (Na *p*-chlorophenolate), and essence of mustard on milk is studied. As compared to controls the effect on the no. and kind of bacteria, time of spontaneous coagulation, time of coagulation by boiling is detd. None of these substances are suitable for the preservation of industrial or com. milk. The only likely place of application is in the home.

JULIAN H. LEWIS

**Effect of autoclaving on vitamin content in milk.** E. J. SLANETZ. *J. Dairy Sci.* 6, 237-42 (1923).—The fat-sol. A and water-sol. B of milk autoclaved at 10 lbs. and 15 lbs. pressure for 15 min. are not affected to any appreciable extent when fed as a source of vitamin to growing mice. The mice had been fed on a vitamin-free diet for 15 days previously.

O. L. EVENSON

**Various new methods for the determination of casein in milk.** B. BLEYER AND R. SÄIDL. *Forsch. Geg. Milchwirtsch. Molkereiwes.* 1, 386-95 (1921); *Chem. Zentr.* 1922, IV, 175-6; cf. *C. A.* 16, 1962.—A comparison of several of the most useful methods, including the refractometer method of Brailsford-Robertson (*C. A.* 8, 1313), the iodometric detn. of Army and Schäfer (*C. A.* 8, 3602) and the  $\text{CH}_2\text{O}$  method of Walker (*C. A.* 4, 618), with that of Pfyl and Turnau (cf. *C. A.* 8, 3082). The method of Walker is improved by the use of a control soln. for which milk itself is used, whereby the end point of the titration is detd. reliably. Even with this modification the Walker method is not claimed to be absolutely precise and is not suitable for scientific research, but gives sufficiently accurate results for technical use.

C. C. DAVIS

**Determination of fat in milk.** A. ZEGA AND LILLI ZEGA. *Chem.-Zig.* 47, 405 (1923).—Pipet 5 cc. milk into a 20-25-cc. calibrated tube. Add 2 cc. dil.  $\text{NH}_4$  citrate soln. (d. 1.036-1.040) and then 10 cc. of an  $\text{Et}_2\text{O}$ -alc. mixt. (55 cc.  $\text{Et}_2\text{O}$ , 45 cc. alc.). Stopper and shake. When all particles are dissolved let settle. Note vol. of  $\text{Et}_2\text{O}$ -alc. fat layer, pipet off 1-2 cc. into a tared dish, dry on the steam bath and then at 100-105° for 5 min., cool and weigh.

O. L. EVENSON

**Data secured with the "turbidity point" of butter fat.** ARMIN SEIDENBERG. *J. Assoc. Official Agr. Chem.* 6, 437-40 (1923); cf. *C. A.* 16, 3138.—In a considerable proportion of the samples of cream examd. evidence of adulteration was indicated by the turbidity point alone, the other values being normal. Where other evidence was inconclusive definite confirmation was obtained by the turbidity point. Typical cases are tabulated.

O. L. EVENSON

**Methods for fat in malted and dried milk.** J. T. KEISTER. *J. Assoc. Official Agr. Chem.* 6, 435-7 (1923).—A continuation of the comparative study of "neutral" procedure (*C. A.* 16, 1815) in which the  $\text{NH}_4$  is omitted in the regular Roscoe-Gottlieb method with one modification. This consists in prepg. a 15 or 20% water soln. of the sample instead of weighing out 1 g. of powder. The results are tabulated. The "neutral" process yields a higher % fat in the majority of cases. It is recommended that this method be adopted as a tentative method for the detn. of fat in malted milk.

O. L. EVENSON

**The air content of butter.** OTTO RAHN AND ANNEMARIE STORM. *Molk. Zig.* (Hildesheim) 37, 433 (1923).—A table shows the air content in cc. per 100 g. of butter. The highest air content was 7.2 cc. and the lowest 0.97 cc. In general the butter made during the winter had a lower air content than summer butter. The method of detg. the air content is not given.

O. L. EVENSON

**Butter.** K. H. B. *Chem. Umschau* 30, 98 (1923).—As a counterpart to the unusually soft butter reported by Komnenos (*C. A.* 17, 2156) H. Kreis reports a hard pure butter from the Jura mountains which showed the following consts.:  $n_D^{20}$  1.442, R.M. no. 10.9, Polenske no. 1.3, I no. 40.2 (= 46.6% olein).

P. ESCHER

**A study of the use of superheated and unsuperheated plain condensed bulk skim milk in the manufacture of ice cream.** P. H. TRACY. *J. Dairy Sci.* 6, 205-21 (1923).—Ice cream mixes were prepd. with superheated and unsuperheated condensed milk and studied experimentally. Results are shown in tables and graphs. Superheating causes a change in the albumin from a colloidal to a pptd. form, in this way increasing the viscosity. The viscosity of the ice cream is increased by the use of superheated condensed skim milk, the texture and body are improved and the resistance and overrun are increased. The ice cream made from unsuperheated condensed milk has a better flavor.

O. L. EVENSON

**A new bacillus isolated from oysters.** A. BESSON AND G. BERINGER. *Compt. rend. soc. biol.* 87, 1017 (1922); *Wasser und Abwasser* 18, 59 (1923).—The organism, to which the authors have given the name *Bacillus ostreae*, resembles typhoid bacillus but. liquefies gelatin, decomposes sugars with the exception of lactose, is halogenophilic.

produces no indole, but gives off  $H_2S$ . Animal inoculation has no result.

JACK J. HINMAN, JR.

The use of artificial resins for coating coffee. JEAN BORDAS. *Ann. fals.* 16, 221-4(1923).—Brief description of the prepn. of coumarone resins and of their detection as coating for coffee. Ext. the latter with benzine, evap. the ext. to dryness, saponify, ext. the unsaponifiable with 5 cc. of benzine, shake with 5 cc. of concd.  $H_2SO_4$ . Brownish red coloration of the  $H_2SO_4$  indicates coumarone resins. Vaseline is sol. in benzine but does not color  $H_2SO_4$ ; shellac is very slightly sol. in benzine. A. P. C.

The analysis of molasses feeds. A. MINER AND R. JACQUES. *Ann. fals.* 16, 231-2(1923).—Brief outline of methods found satisfactory for the detn. of  $H_2O$ ,  $H_2O$  ext., sugars, acidity, and sulfated ash. A. PAPINEAU-COUTURE

The nutritive value of the proteins of coconut meal, soy beans, rice bran and corn. H. H. MITCHELL AND VALENTE VILLEGAS. *J. Dairy Sci.* 6, 222-36(1923).—An extension of the work of Nevins (*C. A.* 16, 1284). Data on the metabolism of rats on a N-free ration were obtained. These results were used in detg. the actual digestible N of the protein rations fed. Exptl. data are given for the utilization of coconut, corn and soy-bean meal and mixts., the rations contg. 5 and 10% protein. On a 5% protein ration the av. utilization of coconut meal protein was 77%, corn 72% and soy bean 78%. On a 10% protein ration the results seemed to show that the coconut-meal proteins are slightly less efficient than those of soy beans while between soy bean and rice bran there was no clear difference. Very little supplementary effect was noticed when mixts. of the proteins were fed. The net protein content of a number of feeds is computed. O. L. EVENSON

Composition of the forage plants "Guinea grass" (*Panicum maximum* and *P. jumentorum*) and "malojillo" (*P. harbinode*) grown at Porto Rico. F. A. L. DOMINCURZ. *Gobierno Puerto Rico, Dept. Agr. Trabajo, Estación Exp. Insular, Rio Piedras, Circ. No. 61, 35 pp.*(1922); *Bull. Agr. Intelligence* 13, 1233.—The "malojillo" and the "Guinea grass" are acclimatized and widely distributed in Porto Rico. The averages of analyses made at the Rio Piedras Agr. Expt. Station are as follows:

	Moisture.	Protein.	Fats.	Crude cellulose.	Carbo-hydrates.	Ash.	Nutritive coeff.
<i>Panicum barbinode</i> :							
Av. of all samples (9)	75.97	2.15	0.63	6.47	9.97	2.10	5.3
Samples grown on clay soils	75.23	2.03	0.58	6.12	8.13	2.49	4.9
Samples grown on sandy soils	75.51	2.05	0.60	7.27	11.21	2.14	6.5
Green plants	82.02	2.18	0.76	5.13	7.47	1.40	4.2
Ripe plants	72.95	2.13	0.56	7.48	11.37	2.43	5.9
<i>Panicum maximum</i> :							
Av. of all samples (4)	73.69	1.68	0.578	8.31	10.91	2.53	7.2
Samples grown on clay soils	74.17	1.77	0.693	7.96	9.90	2.69	6.4
Samples grown on sandy soils	73.21	1.60	0.464	8.65	11.92	2.37	8.2
Green plants	77.38	1.81	0.539	6.67	9.61	2.27	5.9
Ripe plants	70.00	1.56	0.618	9.94	12.21	2.78	8.7

D. also gives the analysis of the bays: in the general average there was 8.13% of moisture in the hay of *Panicum barbinode*, and 7.05% in the hay of *P. maximum*. H. G.

Quantitative botanical analysis of feeding cakes. JOH. A. EZZENDAM. *Verslag. Land. Onderzoek. Rijkslandbouwproefsta.* 25, 1-82(1921); *Botan. Abstracts* 12, 219-20.—The most important methods are given, with statements as to their practicability: E. developed a method in which the principle was to find an element for measuring in those cases in which the amt. of a certain constituent could not be found from a comparison by counting or from a comparison by measuring or when no measurable elements or particles were present. A sample of the cake is ground until it passes a screen with circular holes 1 mm. in diam. A definite quantity (0.5-2 g.) is boiled with acids and alkali and washed with hot water on a muslin cloth. The remaining substance is mixed with 10 cc. of a mixt. of glycerol and water (1:1). This is spread on a special glass plate and measurements are made with a Nebelthau or similar microscope. After 15 minutes particles are measured in at least 3 strips and at least 300 fragments. Measuring is the detn. of the no. of squares each particle covers. Then the sum total of the squares covered by all particles is divided by the no. of g. used, the total surface of the rows (each row is 1.2 square cm.), and by the normal no. The no. obtained gives the percentage of the impurity or particles present. The normal no. is the no. of squares covered by the fragments of impurities, or of a certain substance, present on 1 square cm. with 1 g. of a 1% mixt. of impurity or substance.

The normal no. must be detd. for each impurity or substance. The usefulness of this method depends mainly upon the exactness of the normal no. Investigations were made and normal numbers determined for the following impurities or admixts.: rice husks, barley husks, ground nut shells, coffee husks, cacao husks, soy bean, and impurities in linseed cake. H. G.

**Poisonous properties of Sudan grass.** S. M. STENT. *J. Dept. Agr. Union S. Africa* 4, 446-7(1922); *Botan. Abstracts* 12, 223.—This grass, like the ordinary sorghum, sometimes causes poisoning in stock owing to the presence of a compd. of HCN. Glucose, dextrose, and other sugars act as antidotes, while a teaspoonful of soda dissolved in a pint of diluted vinegar has been found an effective remedy. Feeding the animals on starchy food before turning them into the Sudan grass diminishes the danger of poisoning. When made into hay, Sudan grass is very unlikely to be harmful. H. G.

**Comparison between calcium chloride and other calcium salts as a stock feed.** O. LOEW. *Süddeut. Landw. Tierucht* 17, 13-5(1922); *Bull. Agr. Intelligence* 13, 1536.—Ca salts, the carbonate (chalk), and the phosphate have hitherto been fed to young stock in the form of a powder mixed with their rations, for the purpose of promoting bone development. Recent expts. have proved that the Ca salts present in the blood and muscles have other no less important functions than that of building up the skeleton, and must be regarded as factors essential to the normal working of the living organism. It is not known at present how much of the powd. Ca compd. given to the animals is assimilated by the blood and tissues or in what percentage it is absorbed by the stomach. In any case, it is necessary to administer the Ca salts in a form sol. in water and which can be easily assimilated. The use of chalk, the Ca compd. generally employed, has many drawbacks, as Ca carbonate is dissolved by the acid in the gastric juice, which acid is required for digestion and is indispensable for the digestion of albuminoid substances. In order to produce any perceptible effect on the organism, a very large amt. of chalk (50 g.) must be ingested daily; this requires for soln. 18 l. of gastric juice which is thereby completely neutralized and rendered relatively incapable of digesting the remainder of the ration. Further, the lack of gastric juice allows the numerous bacteria in the stomach to multiply freely.  $\text{CaCl}_2$  is preferable to chalk, if given in much smaller quantities, as its effects are quite as beneficial and rapid as those of Ca carbonate and it has fewer drawbacks. In addn.,  $\text{CaCl}_2$  is of therapeutic value in certain specific diseases (diarrhea, and sometimes in deficient bone development) whereas chalk has no such property.  $\text{CaCl}_2$  is more expensive than Ca carbonate, but it is used in smaller quantities and produces a great increase in the live weight of stock, especially in the case of pigs. H. G.

The food value of *Ervum Ervilia* (Visco) 11E. Rapid method of bacterial count (Pozzi-Escor) 11C.

**Storing fresh fruits or other foods.** E. MILANI. U. S. 1,459,232, June 19. Fresh fruits, e. g., peaches or pears, or vegetables or meats are placed in a container and alc. is then burned in the container to consume the O of the air present in it and the material is then sealed in the atm. thus formed of N and  $\text{CO}_2$ .

**Apparatus for heating, pasteurizing or evaporating liquids.** M. C. MAYBEE. U. S. 1,459,182, June 19. The app. is adapted for treating milk.

### 13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

**Chemistry and industry.** E. F. ARMSTRONG. *Chemistry & Industry* 42, 603-12; *Chem. Age* (London) 8, 666-8(1923). E. H.

**Recent developments in chemical plant.** ARTHUR B. SCORER. *J. Soc. Chem. Ind.* 42, 240-27(1923).—Great progress has been made of late years in the manuf. of app. from high-Si irons. Special attention must be given to design, so that all parts of a casting shall cool at approx. the same rate. In this way draw cracks are avoided. Particulars are given of the requirements, design and performance of a centrifugal pump, made of "Meldrum" acid-resisting metal. S. also describes a new form of centrifugal scrubber, more particularly designed for coal gas. No figures are yet available, but perfect circulation of the wash liquid, complete atomization and the production of a very strong liquor are claimed. E. G. R. ARDAGH

**Poisoning by tetrachloroethane among makers of artificial pearls.** LERI. *Soc.*

med. legale, meeting of Jan. 15, 1923; *Paris Medical* (Mar. 17, 1923) p. 248; *Bull. mens. office intern. hyg. publ.* 15, 706 (May 1923).—A polyneuropathy with slow recovery is developed owing to the breathing of  $C_2H_5Cl_4$  fumes.

JACK J. HINMAN, JR.  
Note on the hygiene of workmen in tin plate mills. *Flamury. Bull. de l'inspection du travail* 29, 290 (1921); *Bull. mens. office internat. hyg. publ.* 15, 704 (1923).—In the plate mills heat and grease fumes are objectionable. The latter may be removed by fans. In the pickling rooms the vats are kept at about 90°; vapors of  $H_2SO_4$  are given off and should be removed. The tinning and polishing should be kept sep. as much as possible. In the former tin vapors, palm oil fumes and  $ZnCl_2$  and  $HCl$  fumes are found. Vacuum removal of fumes was unsatisfactory as the palm oil condensed on the app. Tinning should be done in a large room with app. allowing the operator to stay at least 2 m. from the point of the generation of fumes. In polishing work, dust of plaster and wood sawdust is bothersome, and should be removed by suction.

JACK J. HINMAN, JR.  
Lead poisoning caused by cider containing lead; remarks on chronic lead poisoning among the peasants of Lower Austria. G. STEINER. *Z. ges. Neurologie und Psychiatrie* 77, 25 (1922); *Bull. mens. office internat. hyg. publ.* 15, 701 (1923).—Pb poisoning is common among peasants of Lower Austria. Cider is the most frequent cause. As fermenting cider becomes acid it dissolves Pb with which it comes in contact.

JACK J. HINMAN, JR.  
Control of water consumption in the chemical industries. ANON. *Chem.-Ztg.* 47, 481-4 (1923).—Several water meters are described by aid of 17 illustrations.

L. W. RIGGS  
Continuous method of dehydrating alcohol and certain organic liquids. HENRI GUINOT. *Compt. rend.* 176, 1623-6 (1923).—Alcohol is dehydrated continuously in a column by using Young's method of distg. a ternary mixt.  $ClCH:CCl_2$  is used as the entraining liquid. The condensed ternary seps. into 2 layers, of which the upper contains 99% of the  $ClCH:CCl_2$  and can be returned directly to the column. The small amt. of  $ClCH:CCl_2$  in the other layer can be recovered by distn. and the remaining aq. alc. concd. by boiling to 96° and then returned to the column. Pure, anhyd. alc. is drawn from the bottom of the column. Other substances than  $ClCH:CCl_2$  can be used; and the method can be employed for dehydrating other compds. such as aliphatic alcs. and acids, esters, glycerol, etc.

A. W. KENNEY  
Purification of liquids by the simultaneous action of centrifugal force and an electric field. ALFRED MARX AND JEAN ROZIERES. *Compt. rend.* 176, 1396-8 (1923).—The simultaneous application of a centrifugal force and an elec. field ppts. colloidal suspensions which are not affected by either separately. In the app., the outside steel covering of the rotating bowl is the + pole, and copper wires, insulated from the bowl, serve as the - electrode. The potential gradient is about 4000 v. per cm.

J. A. ALMQUIST  
Studies on insulating materials. I. Absorption of moisture by fibrous insulating materials. TSUNETARO KUJIRAI, YÔZÔ KOBAYASHI AND YOTSUO TORIYAMA. *Rikwagaku Kenkyûjo Jû* 2, 105-27 (1923); *Sci. Papers Inst. Phys. Chem. Res.* 1, 79-93 (1923).—Nine fibrous insulating materials were suspended from a beam of a chem. balance by Pt wire and put in a hydrostat containing  $H_2SO_4$  of desired concn. and the hydrostat was placed in a thermostat (30°). By changing the concn. of  $H_2SO_4$  relative humidity in the hydrostat was controlled and the change of weight of the material was measured. The absorption of moisture by fibrous materials depends on the mode of variation of humidity. A considerable difference was observed in the quantity of moisture absorbed, whether the humidity varies from dry to wet or wet to dry. When these changes of weight were plotted in a curve during a cycle of humidity changed, it showed a closed hysteresis loop. The results are given in tables and curves. The relation between the relative humidity and the absorption of moisture is shown by Langmuir's formula for absorption of gas or vapor by a solid:  $Q = 1/[(a/H + b - cH)]$ , where  $Q$  = % moisture absorbed,  $H$  = relative humidity, and  $a$ ,  $b$ , and  $c$  are consts. calcd. from the exptl. results for the 9 materials, as follows: red rope paper, 3.42, 0.172, 0.00158; filter paper, 2.76, 0.179, 0.00153; press board, 3.04, 0.161, 0.00135; leatheroid, 3.26, 0.160, 0.00133; Manila paper, 1.835, 0.175, 0.00156; asbestos paper, 9.00, 0.910, 0.00826; silk, 2.23, 0.148, 0.00137; empire cloth, 18.51, 0.1133, 0.00173; red rope paper (varnished), 11.34, 0.146, 0.00170. For quick comparison of the absorbing power of a great number of samples, the phenomena of temp. rise of the sample caused by the absorption of moisture in a vacuum vessel in a thermostat were utilized. The results are given in diagrams. II. Effect of humidity on the electric resistance of fibrous insulating materials. TSUNETARO KUJIRAI AND TAKEO AKAHIRA. *Rikwagaku Ken-*

*kyujo Ikh* 2, 128-57(1923); *Sci. Papers Inst. Phys. Chem. Res.* 1, 95-124(1923).—Elec. resistances of 11 fibrous insulating materials, rolled on a Au-plated rod and enclosed in a desiccator contg.  $H_2SO_4$  of desired concn., were measured by changing the concn. of the acid and the results were given with tables and curves. The effect of humidity on the materials depends not only upon the actual value of the relative humidity of the atm. in which they are placed, but also upon the previous history of the humidity variation. If the logarithmic values of insulation resistances are plotted in a curve during a cycle of humidity variation, they describe a hysteresis loop. For practical purposes, it will be convenient to express the insulation resistance at a specified humidity with the av. value of the resistance corresponding to that humidity. The av. resistance may be expressed approx. by the equation,  $\log_{10} R = a - [bh/(1 - ch^2)]$ , where  $R$  = av. insulation resistance in ohms,  $h$  = relative humidity expressed in decimals, and  $a$ ,  $b$ , and  $c$  = consts. depending on the material and calcd. from the exptl. results as follows: calico, 11.685, 8.097, 0.057; empire cloth, 9.725, 3.718, 0.315; linen, 11.255, 7.833, 0.114; Manila paper, 11.445, 8.803, 0.00; red rope paper, 11.415, 7.183, 0.202; leatheroid, 11.690, 8.453, 0.062; press board, 11.750, 8.144, 0.134; filter paper, 11.815, 8.165, 0.123; silk, 11.970, 8.960, 0.560; muslin, 11.075, 5.647, 0.348; asbestos paper, 10.915, 6.790, 0.302. The const.  $a$  represents the logarithmic value of the insulation resistance at zero humidity and may be considered as the resistance of the material itself,  $b$  the part of effect proportional to the humidity, and  $c$  the component of effect more than proportional. Materials of vegetable origin such as calico, linen, etc., exhibit very nearly the same variation and vary practically along a straight line, while the other materials such as silk, etc., deviate considerably from a straight line at high humidity and the treated material such as empire cloth is less affected by the variation of humidity.

K. KASHIMA

Standardized insulator tests. A.I.E.E. STANDARDIZATION COMMITTEE. *J. Am. Inst. Elec. Eng.* 42, 739-43(1923).

C. G. F.

Safety and efficiency in the chemical industry. L. A. DEBLOIS. *Ind. Eng. Chem.* 15, 858-60(1923).

E. J. C.

## 14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW AND G. C. BAKER

Preparation of water for filtration. F. A. DALLYN AND A. V. DELAPORTE. *Contract Record* 37, 343-5(1923).—The practice of operating filters dealing with clear lake waters on a clarification basis and relying on chlorination for sterilization is considered sound in respect to the large installations, providing adequate lab. facilities are available. The optimum condition for coagulation with alum was found to be  $pH$  5.5 and 6.5 for soft colored and clear Great Lakes water, respectively.

R. E. THOMPSON

Standardization of methods for analysis of potable waters in the Belgian Army. CH. SILLEVAERTS. *Arch. med. Belg.* 75, 753(1922); *Wasser u. Abwasser* 18, 17(1923).—Methods are given for the usual chem. detns. Bacteriol. work includes counts on meat ext.-peptone-gelatin; *B. coli* detns. with Vincent's phenol broth at 41° and the cholera-red test in peptone water. Waters are to be grouped into 3 classifications: (1) Good; (2) usable after treatment; and (3) bad.

JACK J. HINMAN, JR.

Contamination of the sub-soil as a result of a fire. M. LEVY. *Ann. hyg. publ. med. legale* 38, 284(1922); *Wasser u. Abwasser* 18, 66(1923).—In June 1917 a factory at Grafenstaden, in Alsace-Lorraine burned and water was pumped out to the fire for 24 hrs. from the Ill river. Water of shallow wells nearby became turbid and had a petroleum taste. The chlorides, O consumed, bacterial count and *B. coli* content were all raised. After 6 weeks the contamination had subsided.

J. J. H., JR.

Dangers to the sanitary quality of public water supplies. E. S. CHASE. *J. New Eng. Water Works Assoc.* 31, 16(1923); cf. *C. A.* 17, 1519.—A discussion of contamination hazards of public water supplies before, during and after purification.

W. D. HATFIELD

Durban (So. Africa) water supply. ANON. *Water & Water Eng.* 25, 141(1923).—The Camperdown reservoir has lost 12,272,000 Imp. gal. capacity since Sept. 1920. At Umlas works there are 8 slow sand filters cleaned on an av. of once a month. Goodmore works has 6 slow sand filters cleaned on an av. of 14 times a year. Six new beds similar to the existing beds, but much larger, are being constructed. A clear-water reservoir with earth wall and puddle core has a capacity of 105 mil. gals. (Imp.). Additional pipe lines are being laid to increase the discharge capacity to a minimum of 6



mil. gals. This is the only plant in So. Africa that uses liquid Cl; it has given satisfaction.

JACK J. HINMAN, JR.

**The Calcutta water supply.** ANON. *Water & Water Eng.* 25, 140(1923).—The supply is taken from the River Hooghly and furnishes both filtered and unfiltered water. Filtered water is taken 12 miles above city and passes through slow sand filters.

JACK J. HINMAN, JR.

**The water supply of Montreal.** ANON. *Contract Record* 36, 1260-71(1923); 37, 7-10(1923).—A review of the development of the water works system of Montreal. The supply is drawn from the St. Lawrence River through an open aqueduct  $4\frac{3}{4}$  miles in length.

R. E. THOMPSON

**Medical health officer's report, 1922, Vancouver, B. C., Canada.** F. T. UNDERHILL. 31 pp.—The water supply is drawn from the Capilano River and the Seymour Creek. The av. compn., in p.p.m., of the Capilano and Seymour waters, resp., was: total solids 49.6, 48.3; residue on ignition 31.6, 31.6; org. residue 18.0, 16.7; chlorides 2.77, 2.59; free  $\text{NH}_3$  0.014, 0.013; albuminoid  $\text{NH}_3$  0.028, 0.026; nitrates 0.71, 0.67; nitrites none; and reaction neutral. Only 3 cases of typhoid were reported.

R. E. THOMPSON

**Fortieth Annual Report. Provincial Board of Health, Ontario, Canada.** 1921, 438 pp.—In 1910 there were but 8 filtration plants and 1 chlorination plant in Ontario; in 1921, 42% of the public water supplies were protected by filtration and over 82% by chlorination. The typhoid death rate of the cities in the province has been reduced from 51.3 to 4.3 per 100,000 during the past 12 years. Regulations are given for sanitary control of lumber and timber camps, mining camps, saw mills and other industries situated in unorganized territory. The following special reports are included. **Further experiments on the fertilizing value of activated sludge.** H. D. BROWN. *Ibid* 118-29; cf. *C. A.* 17, 171.—In the light of the expts. carried out in 1920-1 activated sludge can be claimed to possess the quality of giving early acceleration of growth probably to a greater extent than any of the other nitrogenous fertilizers used (cyanamide, dried blood,  $\text{NaNO}_3$ ,  $(\text{NH}_4)_2\text{SO}_4$  and tankage). **Studies in fly control.** A. E. BERRY and C. H. McLEOD. *Ibid* 145-63.—The application to breeding places of a light sprinkling of  $\text{Ca}(\text{OCl})_2$  effectually killed all larvae and continued treatment in this manner practically eliminated the blow-fly from town. Only fresh and exposed feces required subsequent treatment. The control measures applied to manure piles consisted mainly of solns. of stomach poisons; 1-1.5 gallons of soln. per bushel, depending on the amt. of moisture present, was required to obtain an intimate mixture. Hellebore, powd. borax,  $\text{FeSO}_4$ ,  $\text{Ca}(\text{OCl})_2$  and lysol (6%) were ineffective; kerosene, crenoid (4%), Lyman's disinfectant (4%), creolin (4%), pyoxol (3%), carbonol (4%) and  $\text{CH}_3\text{O}$  (17%) gave good results. **Investigations in the sanitation of swimming pools.** A. V. DELAPORTE. *Ibid* 163-74.—If the residual Cl in the pool water before bathing commenced was in excess of 0.2 p.p.m., the water remained practically sterile throughout the bathing period. Algal growths were successfully treated by applying  $\text{CuSO}_4$  after bathing was over Saturday night, the pptd. copper being removed by filtration before bathing commenced on Monday. Analysis of the water showed that no trace of Cu remained in soln.

R. E. THOMPSON

**Typhoid fever at Cochrane.** J. W. S. McCULLOUGH. *Pub. Health J.* 14, 220-2 (1923).—The typhoid epidemic at Cochrane, Ont., is believed to have been directly caused by the pollution of the water supply. The supply is obtained from springs, Spring Lake, the overflow from the springs, being used as an auxiliary supply. During the dry season last fall and during the winter the quantity of water derived from the springs was inadequate and a considerable amt. of water was drawn from the lake, the level of which was consequently lowered by nearly 6 ft. At the time of the outbreak the level of the water was nearly 3 ft. below that of the lower lakes receiving the town sewage, and as result the sewage-contaminated water flowed back and entered the intake. During this time a blanket of snow and ice effectually concealed from view the true conditions. Chlorinating app. has been installed and in operation since that date.

R. E. THOMPSON

**Descriptions of some water-works pumping plants.** P. L. EVANS. *Contract Record* 36, 1278-9(1922).

R. E. THOMPSON

**Steel high-pressure line installed by the City of Ottawa, Ont.** R. E. W. HAGARTY. *Contract Record* 37, 10-1(1923).—After testing to 225 lbs. cold water pressure the pipes were immersed in a coal-tar bath (temp.  $300^\circ\text{F.}$ ) for 5 min., wrapped with a layer of jute hessian cloth, and again treated with tar.

R. E. THOMPSON

**Some conditions affecting Michigan fish life.** E. F. BADGER. *Public Health (Michigan)* 11, 233(June 1923).—The O content of the water and the cause for its

insufficiency for fish life are discussed. In warm weather the water holds less O than in cold weather and the decomn. of org. matter in the water proceeds more rapidly in warm weather, more rapidly exhausting the available O, even though the algae give off O and help. Discussions of parasitic diseases due to worms, fungi and bacteria are given.

JACK J. HINMAN, JR.

**Report on City of Hamilton (Ont.) sewage disposal.** WM. GORE, G. G. NASMITH AND W. SYORRIE. 38 pp. (April, 1923).—During the periods of max. dry-weather flow only 70% passes through the 4 existing disposal plants, the remainder passing directly into Burlington Bay. The water of the Bay is consequently polluted and as a result the water supply, which is drawn from Lake Ontario at a point 4 miles distant from the gap between the Lake and the Bay, has deteriorated. Three systems of sewage treatment, Imhoff, activated-sludge and plain sedimentation, have been considered and it is recommended that the latter scheme, designed in such a manner that the construction of aeration tanks would convert it into an activated-sludge system, be adopted provided treatment of the water is also undertaken. If treatment of the water is not undertaken the activated-sludge system should be installed immediately. Typhoid-fever statistics, analyses of the sewage and water, and details of construction and estd. cost of the 3 systems of disposal considered are included.

R. E. THOMPSON

**The future of the removal of wastes.** THIRISING. *Volkswohlfahrt* (Mar. 1, 1923); *Bull. mens. office intern. hyg. publ.* 15, 703(1923).—A general paper telling of Berlin's difficulties with the disposal of waste.

JACK J. HINMAN, JR.

**The action of hydrocyanic acid on the bacilli of plague.** N. BRUNI. *L'igiene moderna* 15, 353(Dec. 1922); *Bull. mens. office internat. hyg. publ.* 15, 648(1923).—HCN has a certain inhibitory power in a concn. of 10% by vol. and exposure of 24 hrs., but is not an effective disinfectant.

JACK J. HINMAN, JR.

Errors in the determination of  $H_2S$  (HEATH, LEE) 7.

## 15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

**Report of the study of the soil of the first Egyptian zone (Gharbija) in 1921.** F. HUGHES. *Ministry of Agr. Egypt, Tech. and Sci. Service, Bull.* No. 21, 1-11(1922); *Bull. Agr. Intelligence* 13, 1433-4.—The sol. salts content was not very high, being on an av. between 5.82% (at the surface) and 6.45% (at a depth of 3 m.). The amt. of NaCl ranged from 3.84% to 5.40%. Na carbonate was rarely present. Owing to the impermeability of the surface, the chloride could be easily removed by means of proper drainage; this operation would be greatly facilitated by the general absence of the carbonate. The sub-soil is also impermeable, so there is little chance of the salts being carried to the surface by water. At Kafir and Wekala, great success was attained in the reclaiming of saline land of this description. The soil of this zone usually contains but little lime, otherwise its chem. compn. is similar to that of the av. Nile soils. The K content varies from 0.77 to 1.20%; the  $P_2O_5$  ranges from 0.21 to 0.32% and the org. matter from 0.39 to 2.22%.

H. G.

**Measurement of hydrogen-ion concentration in S. African soils in relation to plant distribution and other ecological problems.** J. M. BEWS AND R. D. AITKEN. *S. African J. Sci.* 19, 196-206(1922).—In the soils employed the forest soils on the whole were less acid than open grass field soils. The colorimetric method was employed.

PAUL BOONE

**Distribution of the phosphorus ion in the upper layers of the soil in relation to vegetation and the addition of various salts.** G. LEONCINI AND F. A. ROGAL. *Agr. Italiana* 45, Nos. 4-6, 109-24(1922); *Bull. Agr. Intelligence* 13, 1442-3.—The P ion rapidly becomes fixed in the soil, so that after the application of phosphatic fertilizers, it often happens that P is found only in the upper layers. Crawley found that if soil was irrigated immediately after being dressed with a phosphatic fertilizer more than half the  $P_2O_5$  was fixed in the first 2.5 cm. and  $1/10$  in the first 7 cm., little being found below the depth of 15 cm. When the irrigation was deferred for 15 hrs. the phenomenon was still more accentuated, all the  $P_2O_5$  being practically fixed in the first 7.2 cm. Expts. have been undertaken to ascertain the effect exerted by vegetation or the addn. of sol. salts upon this adsorption. Their action generally renders the distribution of the P ion more uniform, and hence causes it to penetrate more deeply into the soil; they also increase the power of the soil for fixing sol. phosphates. The

authors confirmed the statement that phosphate is chiefly fixed in the upper layers of the soil. They found that the presence of vegetation makes the distribution of P more uniform by reducing the no. of P ions in the upper strata and increasing them in the lower. Different salts, viz.,  $\text{NH}_4$  sulfate, Na sulfate,  $\text{NH}_4$  nitrate, Na nitrate, had the same effect as the vegetation, but vegetation in presence of the salts increased the attraction of the soil for phosphates. The authors also tried to det. the effect of the anions with unvaried cation and reciprocally but the differences were neither large nor const. Thus the  $\text{NH}_4$  ion, if added under the form of phosphate, promotes the descent of the P ion, whereas if added under the form of nitrate, it has the contrary effect; the behavior of the Na ion is just the reverse.

H. G.

Report of a study of the soil of the territory of the right bank of the Diahlah (Mesopotamia). J. F. WEBSTER AND B. VISWANATH. *Dept. Agr. Mesopotamia Mem.* No. 2, 1-20(1921); *Bull. Agr. Intelligence* 13, 1434.—The soil is a calcareous alluvium. It is light and its phys. conditions are good. The salt content is usually too low to have a distinctly deleterious effect. No  $\text{Na}_2\text{CO}_3$  has ever been found in it. The salts percentage is higher in the cultivated regions than elsewhere, which makes it probable that the salts are chiefly derived from the drainage water, and not from the ascent and evapn. of the water of the sub-soil. Almost half the soil is sol. in HCl and is composed to a large extent of the carbonates of Ca and of Mg. The  $\text{P}_2\text{O}_5$  content is sufficiently high to render the application of all phosphatic fertilizers useless, except in the case of intensive cultivation. All the other elements of plant nutrition are present in great abundance which makes this region remarkably suitable for agriculture.

H. G.

Ammonia-absorbing capacity of soils. A. PRITT. *Ann. sci. agron.* [6] 38, 20-35 (1921); *Bull. Agr. Intelligence* 12, 1377-8.—Moor soil readily yields up its  $\text{NH}_3$  to water, and the process is encouraged by the presence of different salts used as fertilizers, such as KCl,  $\text{NaNO}_3$  and lime. Moor soil and kaolin, which are both lime-free, and have an acid reaction, are nevertheless capable of fixing  $\text{NH}_3$  combined with  $\text{H}_2\text{SO}_4$ , but this power is partly masked in the case of moor soil by the  $\text{NH}_3$  the latter gives up to water. Treatment with HCl does not deprive either moor soil or kaolin of their power of absorbing  $\text{NH}_3$  combined with  $\text{H}_2\text{SO}_4$ . The addn. of lime only slightly increases the capacity for absorbing  $\text{NH}_3$  combined with  $\text{H}_2\text{SO}_4$  in the case of the moor soil, and has no such effect for the kaolin. The addn. of lime decreases the free  $\text{NH}_3$ -fixing capacity of both moor soil and kaolin. When the moor soil has no  $\text{NH}_3$  to give up to the water, weak ammoniacal salt solns. are more impoverished by its absorbent power than concd. solns. The fraction of  $\text{NH}_3$  that is fixed decreases when the vol. of the salt soln. is increased, and diminishes when the weight of soil taken is augmented.

H. G.

Fertilizing fish ponds: exchange of bases in the soil. H. MEHRING. *Fischerei-Zig.* 25, 297-9(1922); *Bull. Agr. Intelligence* 13, 1449-50.—In a soil, exchange of bases always takes place when there is an active substance in excess. The following is a characteristic example: if lime is spread in excess on a field rich in potassic minerals, e. g., mica, potash is displaced and exerts its fertilizing action; in a soil of this kind fertilizing on a lime basis is equiv. to potassic fertilizing. But if as a result of an immediate success, too much lime is added, it displaces the K in the form of hydrate or bicarbonate in larger quantity than the plants can absorb, and the excess of potash is carried away by rain. If this process is repeated the soil becomes poor in potash to such a degree as to become sterile. Gypsum may have the same effect. These considerations are applicable to the problem of fertilizing fish ponds. The formation of a reed bed is a certain indication of impoverishment of the soil; if this impoverishment is very marked, horse-tail shows itself. Using lime as a remedy against the reeds only increases the evil, as still more potash is removed from the soil. Fertilizing with 50 kg. of basic slag, 75 kg. of kainite and 150 kg. of marl causes the horse-tail to disappear. The reeds when once rooted out are prevented from returning by a strongly potassic fertilizing. It is always best to give a complete fertilizing on the basis of  $\text{P}_2\text{O}_5$ , lime and potash: but an excess of lime, already given in the basic slag, should be avoided and if necessary corrected with potash.

H. G.

Report of the Government chemist of Sudan, for 1922. A. F. JOSEPH, F. G. MARTIN, B. W. WHITFIELD AND J. S. HANCOCK. *Wellcome Tropical Res. Labs. Chem. Pub. No.* 26, 12-30(1923).—Soils.—Analyses of soils from various parts of Sudan are given. The poorer yielding plots are higher in salt content than are good plots. The alkali condition is presumably due to the irrigation water from the Nile. A rept. of work on the water-holding capacity of soils, H-ion concn. and chem. analysis of soil fractions is given. Dil. solns. of flocculating salts, as  $\text{CaSO}_4$  and  $\text{NH}_4\text{NO}_3$ , reduce the soil moisture equiv. and  $\text{Na}_2\text{CO}_3$  increases it. The effect with gradually increasing concn. of  $\text{Na}_2\text{CO}_3$  is to diminish the moisture equiv., and then increase to a max., after which

there is further diminution. *Oils*.—There was considerable variation in the oil content of cottonseed secured from the various pickings. Seed of cotton picked in Dec. contained 23.4% oil while that picked in Feb. contained 29%. *Field experiments*.—A rept. of fertilizer expts. is given.

What becomes of ammonium sulfate and saltpeter in the soil? A. KILPINGER. *Mitt. deut. Landw.-ges.* 37, 353-4 (1922).— $(\text{NH}_4)_2\text{SO}_4$  reacts with the colloidal Ca and Mg compds. forming  $\text{CaSO}_4$  and  $\text{MgSO}_4$ , which are ultimately washed from the soil. The  $\text{NH}_3$  is absorbed by the soil colloids, retained in the upper layers of the soil and utilized by the growing plants. The continued use of  $(\text{NH}_4)_2\text{SO}_4$  and consequent depletion of soil Ca and Mg cause accumulations of acid salts, resulting in injurious acid soils. When  $\text{NaNO}_3$  and  $\text{KNO}_3$  are applied to the soil the N is partly utilized by plants. A part of the Na and K remains and in very basic soils the alkyl. may be increased until the injurious effects on plants are as pronounced as those produced by acid soils. The alkali nitrates also react with the colloidal Ca and Mg compds. forming  $\text{Ca}(\text{NO}_3)_2$  and  $\text{Mg}(\text{NO}_3)_2$ , which are washed from the soil. The deleterious mech. condition of soil resulting from the use of large excesses of  $(\text{NH}_4)_2\text{SO}_4$  and alkali nitrates may be remedied by the application of lime.

Studies on active bases and excess acids in mineral soils. C. H. SPURWAY. Michigan Agr. Expt. Sta., *Tech. Bull.* 57, 27 pp. (1922); cf. C. A. 16, 308.—The neutralizing values of 4 acid soils were studied, with the H electrode as an indicator and, solns. of  $\text{Ca}(\text{OH})_2$  and  $\text{Al}_2\text{Cl}_6$  or  $\text{HCl}$  as reagents. When soils are treated with  $\text{Ca}(\text{OH})_2$  the reaction proceeds slowly and comes to an equil. at  $p_H$  7.00 with the amt. required to raise the  $p_H$  to this point, in at least 24 hrs.; but in the presence of an excess of  $\text{Ca}(\text{OH})_2$  an equil. is not obtained, indicating that this further reaction is continuous over a long period of time. At least one end point in the soil- $\text{Ca}(\text{OH})_2$  reaction appears to be slightly above  $p_H$  7.00.  $\text{Ca}(\text{OH})_2$  forms salts with soil acids. On addn. of acid, a soil-acid equil. may be obtained in a short period of time in the presence of excess acid; this equil. is nearly const. over a period of several days, showing that a rather sharp distinction may be made between reactive and inactive soil bases. Weak soil acids are split off on treatment with strong acids. Methods are described for detg. the quantity of soil bases, other than Fe and Al, that react with dil.  $\text{HCl}$  and of soil acids in excess of bases. When such methods were applied to a series of soils of varying  $p_H$ , no direct correlations were discovered between soil class, active bases, excess acids, and  $p_H$ ; however, a direct relationship was demonstrated between the base-acid ratio and the  $p_H$  of the soils, indicating that this factor is detd. by the base-acid ratio. The  $p_H$  and base-acid ratio plotted as a curve corresponds to the normal H-ion concn. curve obtained in weak acid-alkali titrations. The quantity of lime required to neutralize the above series of soils did not correlate with the acidity. It is believed that the base-acid ratio in soils is of great practical importance.

Diffusion of carbon disulfide in soil. W. C. O'KANE. New Hampshire Agr. Expt. Sta., *Tech. Bull.* 20, 36 pp. (1922).— $\text{CS}_2$  applied to the surface soil in glass boxes  $6'' \times 6'' \times 12''$  in amts. of 5 dr. killed ants.  $\text{CS}_2$  was applied in the middle of the cube of soil as well as on the surface. When applied 3 in. under the surface ants were killed with doses of 2 dr. When applied in the field, radish and cabbage maggots were killed within 2 to 3 in. of the site of location by doses of 4 dr.

Sulfur and soil acidity. W. A. DELONG. *Sci. Agr.* 3, 354-6 (1923).—Expts. were made by growing potatoes in soil in boxes to which varying amts. of inoculated and flowers of S were added. There was a marked increase of acidity in all cases where S was applied. The acidity increased with the amt. of S applied up to 500 lbs. per acre; beyond this there was no corresponding increase. The uninoculated produced as much acidity as the inoculated. The max. acidity was obtained in every case about 8 weeks after the application. There is a theoretical discussion of the chem. reactions involved.

The effect of borax on the growth and yield of crops. J. J. SKINNER, B. E. BROWN AND F. R. REED. U. S. Dept. Agr., *Bull.* 1126, 1-29 (1923); cf. C. A. 14, 1591; 15, 2327; 16, 4000; 17, 2029.—The effect of borax on potatoes, corn, beans and cotton was studied under varying conditions with a number of soil types and in such a way as to preclude other possible harmful factors. Potatoes can tolerate a greater quantity of borax than crops like corn and beans. The degree of injury is modified by the rainfall and by the manner in which the fertilizer-borax mixts. are applied. When the borax was applied in the row immediately before planting injurious effects were observed with applications of 20 lbs. for potatoes; 5 lbs. for beans; 4 lbs. for corn; and 10 lbs. for cotton. The amts. of borax which the same plants could withstand when the applications were broadcasted or made in the drill some time before planting were 2-5

times as great. The effect of borax was more marked on sandy soils than on the heavier soil types. No injury could be observed the 2nd year after the failure of cotton crop caused by borax in the fertilizer used. W. H. ROSS

Recent developments in the manufacture of superphosphate. ALEXANDER OGILVIE. *Chem. Age* (London) 8, 690-1 (1923). E. H.

Experiments on the fertilizing value of "Supra," disintegrated phosphate in Belgium. J. GRAFTIAU with the collaboration of J. GIELS AND P. HARDY. *Bull. soc. chim. Belg.* 31, 22-3 (1922); *Bull. Agr. Intelligence* 13, 1199.—The test shows the high fertilizing value of "Supra." The increased yields are much the same as those with slag. This fertilizer may be recommended when basic fertilizers are desired. It cannot be mixed either with fertilizers having the power of setting free ammoniacal N or with superphosphates, exactly like slag. The fertilizer should be kept dry and when spreading the workers should protect their respiratory organs. H. G.

The permissible sodium chloride content of ammonium chloride. F. HAÜSSER. *Ber. Ges. Kohlentech.* 2, 77-82; *Chem. Zentr.* 1922, IV, 35-6; cf. C. A. 16, 1007.—The manuf. of  $\text{NH}_4\text{Cl}$  for fertilizer by the  $\text{NH}_3$ -soda process gives a product contg. varying amts. of NaCl. When used as a fertilizer the NaCl is injurious to certain grains. Rape, vegetables and turnips are not affected but tobacco and potatoes are injured if the % NaCl is too high. To insure a harmless grade of  $\text{NH}_4\text{Cl}$  it is recommended that only  $\text{NH}_4\text{Cl}$  with a few percents NaCl be used. C. C. DAVIS

Leucite. J. GIANNOLI. *La Leucite, Memoria premiata col Premio Cesare Zucchini della R. Univ. Bologna* 1921, 56 pp.; *Bull. Agr. Intelligence* 12, 1389-90.—A description is given of the Italian deposits of leucite, its industrial utilization, its utilization by plants and its application to agriculture. Leucite is a powerful potash fertilizer comparable in its effects to Stassfurt salts. Its beneficial action is most pronounced in soil that is rich in lime, less in sandy soil and still less in clay soils. Its effects begin to be shown after the first year and tend to increase with subsequent years. In complete mixts. a combination of leucite with  $(\text{NH}_4)_2\text{SO}_4$  is preferable to one with  $\text{NH}_4\text{NO}_3$ . H. G.

Progress in combating plant pests. A. KÖLLIKER. *Chem.-Ztg.* 47, 501-4 (1923). E. H.

Studies on contact insecticides. C. H. RICHARDSON AND C. R. SMITH. U. S. Dept. Agr., *Bull.* 1160, 1-15 (1923).—This is a report of a lab. study on the effect of a number of org. compds. as contact insecticides for *Aphis rumicis* L. living on nasturtium plants. Compds. which exhibited low toxicity included  $\text{C}_6\text{H}_6$ ,  $\text{C}_6\text{H}_5\text{CH}_3$ ,  $\text{C}_6\text{H}_4(\text{CH}_3)_2$ , pyridine,  $\alpha$ -picoline, the alkaloids with the exception of nicotine, the aliphatic alics., sulfonic acids and their salts, and aliphatic compds. contg. Cl. Essential and fixed oils, the esters of cyclic compds.,  $\text{C}_2\text{H}_5$  derivs. contg. Cl, and the phenols showed some toxicity; the aliphatic amines and substituted  $\text{NH}_3$  compds. showed considerable toxicity. Neither the volatility nor the b. p. is a reliable index of the toxicity or org. compds. when used as contact insecticides. Chem. structure is probably the best empirical guide at present available for the study of contact insecticides, but it does not appear to be a dependable index of toxicity. W. H. ROSS

Some data on the sensitivity of insects to "cyclone" vapor. M. WAGENAAR. *Pharm. Weekblad* 60, 649-54 (1923).—"Cyclone" is a com. prepn. contg. 90%  $\text{EtOCClN}$  and 10%  $\text{EtOCOCl}$ , the pungent odor of the latter serving as a safety precaution. Tests with various types of vermin show this insecticide to be more effective than  $\text{HCN}$ . A. W. DOX

Chemical control of cattle-dipping tanks. C. O. WILLIAMS. *S. African J. Sci.* 19, 137-41 (1922).—In tanks contg. coal-tar derivs. in addition to  $\text{Na}_2\text{AsO}_4$  41.6% oxidation occurs. Only 2.3% oxidation takes place when  $\text{Na}_2\text{AsO}_4$  alone is used. PAUL BOONR

Insecticidal principle in *Chrysanthemum cinerariaefolium* (YAMAMOTO) 10.

GOLDSCHMIDT and JOHNSON: Glimmermineraleernes betydning som kalkkilde for plantene. S. R. 8. Kristiania: H. Aschehoug & Co. Kr. 2.00.

HANSTREIN, CRANNER B.: Om vegetationsforsok med glimmermineraleerne biotit og sericit som kalkkilde. S. R. 14. Kristiania: H. Aschehoug & Co. Kr. 1.50.

JOHNSON: Om tilgodegjørelse af kalkfjeldspatens kalkindhold. S. R. 9. Kristiania: H. Aschehoug & Co. Kr. 2.00.

Preparing manure for fertilizer. H. KRANTZ. U. S. 1,459,050, June 19. Manure

or household or town refuse is heaped in loose layers to permit rapid fermentation and subjected to pressure only to check fermentation when the latter is substantially completed.

**Superphosphate.** H. A. WEBSTER. U. S. 1,459,124, June 19. Phosphorite rock is powdered, suspended in  $H_2O$  and treated with  $H_2SO_4$ , then further dild. with  $H_2O$  and heated to above  $60^\circ$  (preferably about  $85^\circ$ ).

**Fungicide.** J. E. LOHNE. Norwegian 36,527, Jan. 8, 1923. A good spray, especially against the gooseberry mildew, is formed by mixing 800 g.  $Ca(OH)_2$ , 100 cc. concd.  $NaOH$ , 25 g. carbolineum soap and 1 g. lampblack with 3 l.  $H_2O$ .

## 16—THE FERMENTATION INDUSTRIES

C. N. FREY

**Ceylon arrack.** C. T. SYMONS AND W. N. RAE. *J. Soc. Chem. Ind.* 42, 252-4T (1923).—Ceylon arrack is manuf. from toddy, the juice from the young inflorescence of the coconut palm, which contains 13-17% of sugar. The process of manuf. is outlined. The toddy is allowed to ferment 2-3 days. The now highly acid liquor is distd. into a Cu condensing worm, which becomes incrustd., and the distillate contains Cu, sufficient sometimes to impart a taste. Analyses are tabulated of 15 licit and 3 illicit arrack samples.

W. H. BOYNTON

**Pasteurization (of beer) and furidities caused thereby.** H. LÜERS. *Z. ges. Brauw.* 45, 159-62, 164-8 (1922).—The deposits causing turbidity obtained after pasteurizing beer consist of proteins, chiefly those of yeast, together with other colloidal components of the beer. The external avoidable causes of turbidity in pasteurized beer are contact of beer with tin, alk. glass or cork previous to pasteurization. Pasteurized beer is sensitive to low temp. and the deposits do not pass into soln. again when heated. Ultramicroscopic examn. indicates that the no. of particles increases during pasteurization. Prevention of pasteurization turbidity may be effected by (1) stabilizing the labile colloids by the addn. of gums, dextrans or hop resins and by using soft  $H_2O$  in brewing, (2) removal of the labile colloids by means of papain or precipitants, (3) by pasteurizing the beer by means of ultra-violet radiation. \* The latter method, on account of the prolonged exposure required, is not practical.

J. S. C. I.

**The stimulation of alcoholic fermentation by chemically defined substances.** T. SONA. *Biochem. Z.* 135, 610-20 (1923); cf. *C. A.* 16, 1594.—The following substances accelerate glucose fermentation: trimethylamine oxide, cinnamic alc., allyl alc.,  $\alpha$ -crotonic acid,  $\alpha,\alpha$ -diketopimelic acid, benzoylacetone and *o*-methylhexanone.

GEORGE ERIC SIMPSON

**Alcohol-producing yeasts.** G. L. FAWCETT. *Rev. ind. agr. Tucumán* 11, 100-2 (1920-1).—Several strains of yeast native to Argentina give higher yields of alc. than selected strains imported from Europe.

L. E. GILSON

**The motor alcohol distillery.** J. P. FOSTER. *Sugar News* 3, 73-9 (1922); cf. *C. A.* 17, 2041.—Molasses is diluted with 4 times its vol. of pure water to obtain 10-15% fermentable sugar in the sugar soln. Aerating equipment in the fermentation vats is essential for high yields. A minimum of 45 gals. fermenting capacity is required for each gal. of alc. desired. If pure cultures are not used, rapid distn. of the beer is essential to avoid loss of alc. by acetic fermentation. Careful fractionation of the alc. is not essential as all combustible products are valuable in motor alc. A still with 50% overcapacity should be used, as emergencies often necessitate the handling of large vols. of low-alc. beer. Special attention is necessary in the ether still. Safety devices and easily replaced parts add to the value of the ether still. Absolute neutralization of all ether prepared is essential in the manufacture of motor alcohol.

C. H. C.

**Motor spirits and ethylite.** L. J. LAVÉDAU. *Louisiana Planter* 70, 348 (1923).—A review of the composition and properties of alc. mixes. which are used as motor fuels.

C. H. C.

**Propionic acid and ketones from whey.** E. O. WHITTIER AND J. M. SHERMAN. *Ind. Eng. Chem.* 15, 729-31 (1923).—The most favorable conditions for the production of  $PrOH$  from lactose by fermentation with *Bacterium acidipropionici* are at  $pH$  7, and in combination with an accelerating organism such as *Lactobacillus casei*. The proteins of whey are more stimulating to the mixed cultures than either peptone or yeast. A high concn. of lactose is harmful. Under the best conditions an 86% yield of  $PrOH$  was produced in 12 days;  $AcOH$  is produced at the same time. Dry distn. of the  $Ca$  salts of the mixed acids obtained from the fermentation gave an acetone oil contg. 20%  $Me_2CO$ , 40%  $MeCOEt$ , and 40%  $Et_2CO$ .

T. S. CARSWELL

## 17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

**Quinetum and quinine.** A. GROOTHOFF. *Indische mercur* 46, 423-4 (1923).—Quinetum is a mixt. of quinine (2.9-22.2%), cinchonidine (24-60%), cinchonine (18-54%), and quinidine (2.8-5.4%). It cannot be recommended as a substitute for quinine because of its varying compn., the toxicity of the alkaloids which it contains, and the lack of a reliable action. The cultivation in the Dutch Indies of the tree, *Cinchona pahudiana*, from which quinetum was prepd. was given up in 1884 in order to cultivate the *Cinchona ledgeriana* Moens, from which pure quinine can be prepd. R. BRUNNER

**Evaluation of quinine sulfate pills.** L. M. LANSBERG. *Pharm. Weekblad* 60, 729-30 (1923).—Grind 5 pills with 10 g. of clean ignited sand and transfer to a flask. Add 10 cc. of a mixt. of 2 vols. abs. EtOH and 1 vol. CHCl<sub>3</sub>, and place in a bath at 45-50° for 5 min. with occasional shaking. Filter into a tared dish. Repeat this treatment twice with 5 cc. of the EtOH-CHCl<sub>3</sub> mixture. Evap. the solvent on a boiling water bath and dry to const. wt. A. W. DOX

**Matriculation sheets.** A. SCHAMMELROUT. *J. pharm. Belg* 5, 238, 270, 286 (1923).—Monographs intended for the Belgian National Formulary are presented for ZnBr<sub>2</sub>, Zn phenolsulfonate, Zn valerate. A. G. DU MAZ

**Emulsion of coal tar.** R. HUEBRE. *Répert. pharm.* 35, 129-32 (1923).—The emulsion of coal tar of the French Pharmacopœia is prepd. by heating on a water bath 1 part of coal tar with 4 parts of tincture of quillaja and sepp. the undissolved residue. One part of the liquid portion is then diluted with 4 parts of water. As 100 parts of the tincture take up only 4.4 parts of tar, the emulsion is in reality not one of coal tar, but of the constituents of coal tar sol. in the tincture. H. proposes the following method for making an emulsion which will contain practically all of the constituents of the tar: Dissolve 10 g. of coal tar in a mixt. of 20 g. of acetone and 20 g. of CHCl<sub>3</sub>. Mix 10 g. of this soln. with 20 g. of tincture of quillaja and 20 g. of distd. H<sub>2</sub>O. A. G. DU MAZ

**Scientific aspect of cosmetics.** C. P. WIMMER. *Am. Perfumer* 18, 177-8 (1923).—Following a brief statement giving some statistics on the growth and present magnitude of perfume and cosmetic manuf., W. discusses the many topics embraced in cosmetics as a subject, the beneficial effects of cleansing preps., and finally the conditions where cosmetics might really prove harmful. W. O. E.

**Estimation of yohimbine in yohimbe bark.** H. VOGTHER and R. N. KING. *Pharm. Ztg.* 68, 447 (1923).—After referring to certain inaccuracies in Schomer's method (cf. C. A. 15, 2528; 16, 3526), V. and K. advocate the following procedure as being more nearly quant. and yielding a hydrochloride of greater purity, m. 285-7°. Mix 50 g. of the powd. bark (No. 4 sieve) in a porcelain dish with 30 cc. NH<sub>4</sub>OH (d. 0.91), and pass through a No. 3 sieve into a flask contg. 270 cc. CHCl<sub>3</sub>, heating the mixt. in the H<sub>2</sub>O bath 1 hr. with reflux. Cool, strain and press till the runnings amt. to 185 cc. Repeat the treatment twice with 220-cc. and 200-cc. portions of CHCl<sub>3</sub>, recovering 180 and 160 cc., resp., of the CHCl<sub>3</sub> exts. Filter the combined liquids (525 cc.) and concentrate by distn. to 100 cc., then shake in a separatory funnel with four 30-cc. portions of 1% AcOH. To the combined acetous exts. add a trace of "blankit" or SO<sub>2</sub>, filter and ext. in separatory with 50 cc. of Et<sub>2</sub>O to remove impurities. Add NH<sub>4</sub>OH in excess and ext. with Et<sub>2</sub>O until a test with Mayer's reagent shows that no more alkaloid is extd. Wash the combined Et<sub>2</sub>O exts. once with H<sub>2</sub>O, dry over anhydrous Na<sub>2</sub>SO<sub>4</sub>, filter and distil to a very small vol., finally transferring the residue quant. to a 30-cc. Erlenmeyer flask, then evap. the Et<sub>2</sub>O completely. Dissolve the residue in 3 cc. abs. EtOH and add 4 drops HCl (d. 1.19). Let stand overnight, transfer to a tared 5-cm. filter, washing the last crystal remnants on to the filter with a mixt. of EtOH and Et<sub>2</sub>O (d. 0.720) 3:1. Finally wash with Et<sub>2</sub>O, dry and weigh. W. O. E.

**History of capillary analysis in pharmacy.** CURT WACHTEL. *Pharm. Ztg.* 68, 447-8 (1923).—A reply to Platz (C. A. 17, 1529). W. O. E.

**Drugs and chemicals examined in 1921 and 1922.** W. ZIMMERMANN. *Pharm. Zentralhalle* 64, 271-5 (1923).—Results of the examn. of some 45 different commodities are recorded. W. O. E.

**Disinfecting power of "Synthargol."** A new colloidal-silver product. R. GOBBT. *Schweiz. med. Wochschr.* No. 24, 617-8 (1922); *Abstracts Bact.* 7, 67.—Synthargol, a brown powder, composed of 90% of bile salts and 10% of colloidal silver, is readily sol. in hot or cold water or in 95% alc. In a 0.5% concn. it kills *Staphylococcus aureus* in 1 min.; in 0.001% it kills in 8 hrs. *B. coli* and *B. typhosus* are killed by a 5% soln. in 1 hr. H. G.

**Investigations on Indian opium. III. Studies in the meconic acid content of Indian opium.** H. E. ANNETT AND MATHURA N. BOSR. *Mem. Dept. Agr. India Chem. Series 7*, No. 6, 215-21 (1922); cf. *C. A.* 15, 243; 16, 1484.—The meconic acid content of opium varies directly as the total alkaloid content and it appears sufficient in amt. for all the alkaloids to be combined as meconates. The sol. sulfate content of the latex increases as the alkaloidal content diminishes. The sulfate is apparently present in a mineral form and the alkaloids as meconates only, the acid reaction of the opium being due to the dissociation of the meconates of the weak bases, narcotine and papaverine.

**Saffron and its adulteration.** G. PIERLOT. *Ann. fals.* 16, 215-21 (1923).—P. has already shown that the N content of saffron is practically const. (*C. A.* 10, 1690). Ordinary saffron (*Crocus naturalis*) contains 2.30% N and cut saffron (*Crocus electus*, Austrian saffron) 2.40%. The current method of adulteration is by means of sugar and  $\text{Na}_2\text{SO}_4$ . It can be estd. with certainty by detg. on the material after drying 2 hrs. at 95-100°, grinding, and drying again for 1 hr.: N by Sysley's method, asb (not above dull redness), reducing power before and after inversion (on 1% ext., which must be prepd. with cold water to prevent inversion of the cane sugar, by using Bertrand's method and tables), and  $\text{SO}_4$ . Analyses of 1 pure and 5 adulterated samples are given.

**Certain vegetable powders of the Codex.** CHEVALY AND DALMER. *Bull. sci. pharmacol.* 30, 258-65 (1923).—Com. powders were examd. as follows: ipecac 105 samples, nux vomica 75, black mustard 36, rhubarb 89, belladonna 75 and lycopodium 27. The phys. chem. and pharmacol. properties were detd. and compared with the specifications for these drugs by the Codex.

**Cod-liver oil.** EMILE ANDRÉ. *Bull. sci. pharmacol.* 30, 267-80, 352-61 (1923).—Beside *Gadus morrhua* L., other species of the genus *Gadus*, notably *G. virens* L., and *G. eglefinus* L. furnish the oil. The geography of the centers of production in the north Atlantic and north-Pacific oceans is described. The Lofoden and Finnmark methods for the prepn. of the medicinal oil are given in detail. Specifications for the oil are quoted from the pharmacopeias of Norway, U. S., Japan and France. Under chem. compn. the (1) satd. fatty acids, (2) non-satd. monoethylenic acids and (3) the more strongly non-satd. acids are discussed. (4) Unsaponifiable matter consists principally of cholesterol. Among the accessory substances in cod liver oil are (5) compds. of Br, (6) compds. of I, (7) biliary matter, (8) org. bases, and (9) vitamin A. The therapeutic action of the oil is attributed to the constituents numbered (2) (5) (6) (7) (8) and (9).

**Principles that can be extracted from the medicinal and perfume plants of Sicily.** G. PELLINI. *Boll. sci. tecn. periodico bimestrale per gli a i del comitato nazionale sci. tecn. per lo stit. ppo l'incremento dell'industria ital.* 3, No. 2, 72-8; *Bull. Agr. Intelligence* 12, 1193.—The essential oils of the following plants were distd. *Origanum siculum* (var. *Benthianum*), *Ruta bractea*, *Myrta communis*, *Eucalyptus globulus*, *Menha pulegium* (var. *hirsuta* Gussone), *Calamintha nepeta*, *Sanolima chamecyparissus*, *Chenopodium multifidum*, *Rosmarinus officinalis*. The oil of the Sicilian marjoram is used as a condiment by the natives. The variety examd. contd. 49.5% of phenol, mostly thymol. About 98% of the essential oil of *Ruta* consists of  $\frac{2}{3}$  methyl heptyl ketone and  $\frac{1}{3}$  methyl nonyl ketone.

Citric acid (BROEKSMIT) 7.

**Pyrazolone derivative of diethylbarbituric acid.** E. STARKENSTEIN. U. S. 1,459,347, June 19. By the combination of diethylbarbituric acid with 2 mol. proportions of 4-dimethylamino-1-phenyl-2,3-dimethyl-5-pyrazolone by melting together at 110° a product is obtained which m. 95-97°, is of yellow color and may be used as an analgetic.

## 18—ACIDS, ALKALIES, SALTS AND SUNDRIES

FRED C. ZEISBERG

**The history of void tower sulfuric acid chambers.** P. FARRISH. *Chem. Age (London)* 3, 692-4 (1923).

**Lead chamber process in iron receptacles.** C. ORL. *Chem.-Ztg.* 47, 485-6 (1923).—By the Opl system in the manuf. of  $\text{H}_2\text{SO}_4$ , the lead chambers and the absorption towers are replaced by 6 closed iron receptacles connected in series and half filled with "nitrose."



SO<sub>2</sub> is driven through the 6 receptacles and finally over coke. H<sub>2</sub>SO<sub>4</sub> of 50 to 60 grade is thus produced without attacking the iron. L. W. RIGGS

Potash from seaweed in California. A. W. ALLEN. *Chem. Met. Eng.* 29, 49-52 (1923).—A history and description of the industry. E. H.

Production of hydrogen by the thermal decomposition of oil. E. R. WHAVER. *Chem. Met. Eng.* 28, 1072-5(1923); cf. *C. A.* 17, 2477.—This installment deals with the excessive losses in blast gas and by radiation, the refractories required in the process, the type of C giving best results, and the probable costs of H production with several different lay-outs. Self-bonded silicon carbide and a kaolin brick made by a recently developed secret process are the best refractories. Nichrome should be used where machined surfaces, such as valve heads and seats, must withstand high temps. Valves between vaporizer and generator, and vaporizer and preheater should be in contact with water-cooled steel supports. If conducted on a large scale it would be advantageous to secure petroleum residue in a condition to produce oil and C in proper proportion and to complete the distn. at the H plant with the production of a dense residue. The waste heat would then be available for the distn. and the hydrocarbon vapors would be conducted without condensation to the H generator. First cost and the skilled labor required make the combined distn. and H production process impractical for intermittent operation. W. H. BOYNTON

Sulfur and pyrite. ANON. *Svensk Pappers Tid.* 26, 44-6, 61(1923).—A resumé of present production and export of S and pyrite. W. SGERBLOM

The air slaking of lime. F. H. RHODES, W. H. JONES and W. R. DOUGAN. *Chem. Met. Eng.* 28, 1066-9(1923).—Air slaking of lime involves absorption of H<sub>2</sub>O and of CO<sub>2</sub>. In high-Ca limes hydration is more rapid than carbonation and the H<sub>2</sub>O taken up is greater than that required to convert the CaO to Ca(OH)<sub>2</sub>. The % of "active CaO" decreases rapidly as hydration and carbonation proceed. This is probably due to crystn. of the very reactive amorphous hydrate and the formation of relatively inert cryst. hydrate. Magnesia limes exhibit a more regular and more gradual increase in H<sub>2</sub>O and CO<sub>2</sub> content and a more uniform and less rapid decrease in "active CaO." The data given cannot be applied directly to the slaking of lime under all conditions because of the many factors involved. W. H. BOYNTON

Chemical tests of compressed oxygen for inhalation. K. SHEKATA. *J. Pharm. Soc. Japan* No. 495, 319-23(1923).—Twelve different samples of compressed O<sub>2</sub> prep'd. in Japan are tested for O<sub>2</sub> (NH<sub>4</sub>-Cu and pyrogallol tests), H<sub>2</sub> (reduction of molybdic acid by heated Pt), HCl, CO<sub>2</sub>, and acidity. The results show that all contain more than 95% O<sub>2</sub>, a trace of N and CO<sub>2</sub> (1/10-1/50 of the purest air), give no positive test with AgNO<sub>3</sub> and are perfectly safe for inhalation. S. T.

Plants for the liquefaction of air and the production of oxygen and nitrogen. ERNSER BLAU. *Chem.-Ztg.* 46, 85-8(1922).—An illustrated description of present equipment for liquefying air with recovery of O and N, with special reference to the Heylandt system. C. C. DAVIS

Analytical study of the solvents used in the manufacture of boot blacking. M. A. LEJBUNE. *Bull. fed. ind. chim. Belg.* 2, 329-35(1923).—A review of the well known physical and chem. properties of solvents such as turpentine, white spirit gasoline, C<sub>2</sub>H<sub>5</sub>Cl, C<sub>3</sub>H<sub>7</sub>Cl and tetralin. R. BRUTNER

The adhesives industry. HANS WAGNER. *Chem.-Ztg.* 47, 249-51, 289-91(1923).—The most important materials used in adhesives are animal proteins, carbohydrate materials, sulfite waste liquor, rosin, and waterglass. A table of the properties of 15 varieties of these is given. The properties may be varied to meet requirements by addns. and mixts. Hygroscopic agents increase the elasticity and adhesion on tin plate. Although neutrality is desirable, most adhesives are either alk. or acid. Sulfite waste liquor and casein give the best adhesion on linen. Alk. adhesives tend to penetrate paper and to destroy Fe tannate inks. The prepn. of adhesives for household purposes is reviewed. WM. STRICKER

The production of decalcomanias. MAURICE DE KEGHEL. *Rev. prod. chim.* 26, 293-6, 329-32, 365-8(1923).—A detailed description of the production of the varnishes and pigments, the prepn. of the inks and the paper, printing of the paper, and transfer of the image to porcelain, glass, metals, etc. A. PAPINEAU-COUTURE

BUGGE, C. and FOSLIE, S.: Norsk arsenmalm og arsenfremstilling. S. R. 6. Kristiania: H. Aschehoug & Co. Kr. 1.00.

LUK'IANOV, P.: Sulfuric Acid Manufacture. (In Russian.) Moscow: Gostechizdat. 432 pp.

**Oxidizing ammonia.** F. BENSA. U. S. 1,458,969, June 19. A layer of metallized asbestos and sep. layers of Cu oxide, Fe oxide and rare-earth oxides are subjected to the action of a mixt. of steam, hot ammoniacal gases and air in a retort maintained at a temp. of 600–800°. After the mixt. of gases passes through the layers they are treated with alk. carbonate in receptacles maintained at 300–350° to form nitrate, *e. g.*,  $\text{NaNO}_3$ .

**Separation of iron from aluminium nitrate.** NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAP. Norwegian 36,430, Jan. 2, 1923. The hot, concd. soln. of  $\text{Al}(\text{NO}_3)_3$ , which may be alk., flows in a thin jet or in drops into a cold alk. soln. of  $\text{Al}(\text{NO}_3)_3$ . Crystals of pure  $\text{Al}(\text{NO}_3)_3$  are sepd., while Fe and other impurities remain in soln.

**Magnesium sulfate from rocks.** AKTIESELSKAPET DE NORSKE SALTVERKER. Norwegian 36,429, Jan. 2, 1923. Olivine and serpentine are decomposed by 30–60%  $\text{H}_2\text{SO}_4$  at a temp. that is gradually increased from 60° to 104°. The materials are so finely ground that the main reaction takes place between 80° and 90°.

**Pressing powdered salt.** H. W. BARTLETT. U. S. 1,459,082, June 19. Powdered salt (salt "dust") is compressed, *e. g.*, by the action of rollers, and the pieces thus formed are broken up, *e. g.*, by another set of rollers, and screened to sep. particles of table-salt size. Other cryst. substances may be similarly treated.

**Sulfur kiln.** ATRHUR HANSEN. Norwegian 36,766, Feb. 12, 1923. A horizontal cylinder, provided with a rotary system of shovels that work into the S and carry it into contact with the oxidizing air, is combined with an oxidation tower where the gases from the cylinder are completely oxidized. Extra air may be applied to the tower, if necessary. Cf. C. A. 17, 618.

**Rotary lime kiln.** M. HERMANN. U. S. 1,459,302, June 19.

**Polishing composition.** A. C. HOUSWORTH. U. S. 1,459,056, June 19. A mixt. for polishing stoves or other metal articles is formed of oil-free soap 40,  $\text{H}_2\text{O}$  40, flake graphite 18 and turpentine 2%.

**Homogeneous porous materials.** NORSKE AKTIESELSKAP FOR ELEKTROKEMISK INDUSTRI. Norwegian 36,759, Feb. 5, 1923. Foaming is promoted in the fusion of slags. (Cf. C. A. 17, 2482.) The foaming substance is cooled to a temp. at which the bubbles will not burst, but the material will remain elastic. Then the mass is given the desired shape and cooled further. App. is described.

**Deodorizing composition.** O. F. REINHOLD. U. S. 1,459,036, June 19. Solid deodorizing hlocks are formed of  $\text{C}_{10}\text{H}_8$  mixed with chlorination products of  $\text{C}_6\text{H}_6$ , nearly free from  $\text{PhCl}$  and from  $p\text{-C}_6\text{H}_4\text{Cl}_2$  and largely composed of *o*- $\text{C}_6\text{H}_4\text{Cl}_2$ .

**Lens-protecting composition.** E. D. TULLYER. U. S. 1,459,380, June 19. A mixt. for use as a temporary protective coating on spectacle lenses is formed of  $\text{C}_6\text{H}_6$  88, resin 10 and tar oil 2 parts.

## 19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

**The basic glasses industry.** A. BIGOT. *Chimie et industrie* 9, 851–62 (1923).—A review of the prepn., properties and uses of artificial basic silicates, describing more particularly B.'s methods and equipment and the properties of his products. A. P. C.

**Note on the slag used in tile-making at Sarregue mines, Alsace.** W. HUGILL AND W. J. REES. *Trans. Ceram. Soc. (England)* 21, 317–9 (1921–2).—The slag, admixed with clay, is used for the production of vitrified floor tiles. It consists of a black glassy matrix through which crystals of melilite are dispersed. J. S. C. I.

**The chemistry of colloidal china clay.** A. B. SEARLE. *Chem. Age (London)* 8, No. 205, 8–9, No. 209, 8–9; *China Clay Trade Rev. Section* 1923.—Theories regarding plasticity are discussed, also the properties of china-clay sols. C. H. KERR

**Production of porcelain for electrical insulation.** FRANK H. RIDDLE. *J. Am. Ins. Elec. Eng.* 42, 743 (1923); cf. C. A. 17, 2483. C. G. F.

**Chemical porcelain.** G. N. WHITE. *Trans. Ceram. Soc. (England)* 21, 320–7 (1921–2).—The resistance to fracture, in consequence of abrupt changes in temp., of heterogeneous supercooled fluids, of which hard porcelain is a type, is in general raised by conversion as far as possible into the cryst. state. This requires the bulk of the  $\text{Al}_2\text{O}_3$  in porcelain to have crystd. out as sillimanite. The formation of sillimanite is the more complete the lower the proportion of bases present, although a certain proportion of bases is essential to the formation of sillimanite. The practical problem

is therefore to det. the minimum proportion of bases which gives under practicable time-temp. treatment a totally impermeable body. The relative resistance to fracture of porcelain was detd. by heating test-pieces in a bath of molten  $\text{NaHSO}_4$  at a definite temp. and then transferring rapidly to a bath of eosin soln. J. S. C. I.

**Refractory silica materials of S. Wales, with special reference to the influence of texture.** W. R. R. JONES. *Trans. Ceram. Soc. (England)* 21, 358-93(1921-2).—Microscopical examn. indicated that quartzites suitable for use in the manuf. of silica bricks should consist of angular grains set in a siliceous cement in optical continuity with the quartz grains, and should contain some chert or crypto-cryst. silica, but little non-siliceous matter. They should show a wave-like extinction of the quartz grains. The crushed silica rocks and sands were graded by sieving and by the elutriation of the material passing through a 30-mesh sieve. The results obtained gave further evidence of the similarity of the materials used in S. Wales for the manuf. of silica bricks. Test-pieces molded with water from the raw materials and without the addn. of any bonding material were heated to  $1350^\circ$  and their cold crushing strengths subsequently detd. It was seen that the finer the grade of the material the higher was the compressive strength of the test-pieces. The drying shrinkage was small, while a further shrinkage of about 0.2% was found after firing to  $1000^\circ$ , but the bricks began to show expansions after burning at  $1100^\circ$ . The sp. gr. of the bricks decreased with successive firings, the rate of conversion of the quartz increasing with the fineness of the material. J. S. C. I.

Clay at Nankwan (IHARA) 8. Porcelain clay and fire clay in Nishikamo County, Aichi prefecture (KRYŌNŌ) 8. An electric furnace for the melting of quartz goods (SCHUEN) 4.

MALINOVŠZKY, A.: *Ceramics. A Manual for Chemists, Engineers and Manufacturers.* London: Scott, Greenwood. 282 pp.

SPRINGER, LUDWIG: *Das Glas.* Halle (Salle): W. Knapp. 104 pp.

ZSCHIMMER, EBERHARD: *Theorie der Glasschmelzkunst als physikalisch-chemische Technik.* I. Jena: Volkshuchhandlung. G.m.h.H. 128 pp.

Laminated ceramic material. M. C. BOOZE. U. S. 1,459,357, June 19. A material adapted for use as "non-slip tile" is formed by mixing  $\text{Al}_2\text{O}_3$  grains or similar granular material with a ceramic bond (contg. a material such as hall clay and bentonite which will produce a high drying shrinkage) and firing with a ceramic backing.

## 20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

The necessity of changing the standard specifications for cement. MAX GARY. *Mitt. Materialprüfungsamt* 40, 33-42(1922).—The term "cement" should be applied to portland cement, natural cement, mixts. of portland cement with slag, trass, sand, etc., iron-portland cement, blast-furnace cement, trass cements, mixed cements, and to Crappier and Roman cements which are not heated to sintering temp. during manuf. The term should not be applied to wood cements, organic cements, etc. **Packing.**—The Deutsche Beton Verein recommends the use of net weight as the basis of the packing and selling of cement. **Setting time.**—The needle test is misleading because neat cement gives results which are not comparable with those obtained from cement mortars. **Constancy of vol.**—The boiling test gives satisfactory results. **Fineness.**—Sieves do not give useful results. An air-separator should give better results. **Compressive strength.**—Cements should be mixed in varying proportions with a standard sand and test specimens made. The strengths should be detd. and the highest value obtained in a series of specimens should be taken as the result, rather than the av. value. **Resistance to shock.**—There is no satisfactory test. **Mineralogical composition.**—Binding power of a cement is dependent on fineness and on the proportion of the various components. G. considers Colony's work (cf. C. A. 15, 3378, 4044) incorrect. R. F. SCHNEIDER.

**Chemical-technical problems in the manufacture of cement.** C. R. PLATZMANN. *Zement* 11, 137-8; *Chem. Zentr.* 1922, IV, 32.—The effect of the addn. of  $\text{CaCl}_2$  to cement and the efflorescence of cement tiling and its causes are described. C. C. DAVIS.

**Physical investigations of the hardening process of cements.** ELMER SCHMIDT. *Zement* 11, 112-5; *Chem. Zentr.* 1922, IV, 51.—With an app. first devised by Keller, with which change in vol., absorption of  $\text{H}_2\text{O}$  and temp. can be simultaneously detd.

photographically for the same sample, 11 cements were investigated. The results, given graphically, indicate that hardening proceeds in 3 distinct phases, which are characterized by: (1) the absorption of  $H_2O$  and increase in vol. without evolution of heat, (2) great evolution of heat and  $H_2O$  absorption without increase in vol. and (3) a subsequent slow absorption of  $H_2O$  without a distinct max. and without any considerable evolution of heat.

C. C. DAVIS

**The setting of portland cement.** W. L. GADD. British Portland Cement Research Association, *Pamphlet No. 1*, 34 pp. (1922).—The paper contains (1) a review of the theories of hydration and a summary of the results of some previous investigations on the effects of temp., aeration, fineness, the presence of sol. salts, and the constitution of port. cement on the setting time; and (2) an account of the work of the British Portland Cement Research Association in this field. Samples studied included com. cements produced in rotary, chamber, and shaft kilns, and ground with steam and gypsum to regulate the set, and also one untreated cement which had been produced in a rotary kiln. The influence of the following on the setting time of the samples was studied: (1) Storage in sealed containers (at different temps. and in the presence and the absence of light). (2) Exposure to gases including dry air free from  $CO_2$ , dry  $O_2$  and  $O_3$ , moist air free from  $CO_2$ , moist  $O_2$  and  $O_3$ , ordinary lab. air, dry  $CO_2$ , and moist  $CO_2$ . (3) The addn. of sol. inorg. compds. including the carbouate, nitrate, chloride and sulfate of K, Na, NH<sub>4</sub>, Al, Zn, Co, and Cr, and to a more limited extent  $Na_2B_4O_7$ ,  $Na_2B_2O_4 \cdot 10H_2O$ , KOH, NaOH,  $NH_4OH$  and  $Ca(OH)_2$ . In most cases the chemicals were thoroughly ground and mixed with the cement a few hrs. before gaging with water. Both the anhyd. and the hydrated forms of some salts were employed for the purpose of studying the effect of water of crystn. The following are the summary and conclusions, in part: (1) Storage in sealed containers has no effect. (2) The moist gases (except  $CO_2$ ) retarded the set. (3) The dry gases (except  $CO_2$ ) had no effect. (4) Both moist and dry  $CO_2$  accelerated the set. (5) Of the various sol. inorg. compds. studied, the nitrates had no effect; gypsum and plaster of Paris retarded the set; the other compds. (including the sulfates, with the exception of gypsum and plaster of Paris) accelerated the set. (6) Cement abstracts water from salts contg. water of crystn. with which it lies in contact for some weeks. Such water hydrates the cement particles and retards the setting time. (7) The reason for the acceleration or retardation of setting time by sol. salts is not sufficiently clear to warrant a definite conclusion as to whether the action is catalytic or not. In some cases, chem. reaction undoubtedly occurs (e. g., with  $NH_4$  salts and  $Fe_2(SO_4)_3$ ), and it is reasonable to surmise that the action in other cases is also chem. It does not, however, appear that the alteration in setting time, brought about by the addn. of salts, is directly due to the formation of double salts, except perhaps when the double sulfate of lime and alumina is formed. In several instances the effect on setting time appears to be clearly dependent upon the presence or absence of crystn. water in the salt used. (8) The results of this research lead to the conclusion that the use of gypsum as a retarder is sometimes uncertain and irregular in its effects. On the other hand, the regulation of setting time by hydration, through the medium of steam or water appears to be more permanent.

J. C. WYR

**The petrography of portland cement clinker.** M. v. GLASENAPP. *Zement* 12, 133-6 (1923).—G. compares the microscopic structures of port. cement clinker as prepd. in 1876 with those prepd. at the present time. Clinkers of 1876 contain chiefly belite and celite with small amts. of alite. Those prepd. to-day contain chiefly alite and glass. This difference is due to improved methods of sintering.

R. F. SCHNEIDER

**Requirements of a refractory mortar.** R. F. LINDSAY. *Chem. Met. Eng.* 28, 1080 (1923).—A refractory mortar must have a m. p. close to that of the brick with which it is used. The expansion and contraction of the mortar and also its chem. properties should be similar to those of the brick.

W. H. BOYNTON

**Consistency of road tars.** D. C. BROOME. *J. Soc. Chem. Ind.* 42, 192-4T (1923).—Temp.-consistency graphs are presented for prep. tars obtained from Lancashire and North Wales coals carbonized in horizontal retorts. The consistency test used was that prescribed by the Ministry of Transport (Roads Dept.) as described in the new edition of "General Directions and Specifications Relating to the War Treatment of Roads." The instrument used is manuf. by Hutchinson Testing App., Ltd. It combines the advantage of the stem-reading of the Lunge test and the durability of a metal app. The effect of adding Trinidad pitch or Mexican asphalt was investigated, and a chart prepd. showing the percentages of these viscous materials required to produce a blend of definite consistency. Addn. of impalpable mineral fillers has the same effect on consistency regardless of the compn. of the inactive filler. The following relationship holds:  $V_f = V^2$ , where  $V$  is the consistency of the tar and  $V_f$  that of

the mixt. at the same temp. The value of  $x$  varies with the percentage of the filler in accordance with the equation  $x = KF + 1$ , where  $F$  is the percentage of filler added and  $K = 8.5 \times 10^{-3}$ . By combining the 2 equations, the percentage of filler necessary to give a mixt. of a desired viscosity can be calcd. W. F. FARAGHER

## 21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The utilization of fuel residues. H. BRÜCHER. *Chem.-Ztg.* 46, 217-9(1922).—An illustrated description of recent app. (drum separators, etc.) for sepg. and recovering fuel residues, ashes, etc. C. C. DAVIS

Heating air for burning fuel. C. A. MORCK. *Svensk Pappers Tid.* 26, 94-5 (1923); cf. *C. A.* 16, 4323.—A crit. analysis of recent data on heating air for burning fuel. M. tries to show that from the data given in some cases the air heater gives out more heat than is taken in. W. SEGERBLOM

Heating air for burning fuel. F. LJUNGSTROM, K. LINDERSTAM AND E. SPETZ. *Svensk Pappers Tid.* 26, 209-10(1923); cf. preceding abstr.—The reliability of some of Morck's data is questioned and it is pointed out that his premise that all the air for burning fuel passes through the air heater is incorrect. W. SEGERBLOM

Heating air for burning fuel. C. E. NILSON. *Svensk Pappers Tid.* 26, 225-6 (1923); cf. preceding abstr.—An error in Morck's report on the advantage of an air heater for burning fuel is pointed out. The figures 69.6% for boiler with economizer and 83.2% for boiler with air heater are misleading in that the economizer was partly heated with smoke gases from boilers other than the one directly connected with the economizer. W. SEGERBLOM

Heating air for burning fuel. C. A. MORCK. *Svensk Pappers Tid.* 26, 244-5 (1923); cf. preceding abstr.—Sufficient air is drawn in through the drafts and leaks when an air blast is used so that the influence of the chimney on the combustion is counterbalanced. The secondary air should be drawn from the air supply room at definite temp. and pressure. W. SEGERBLOM

Heating air for burning fuel. E. SPETZ. *Svensk Pappers Tid.* 26, 245(1923); cf. preceding abstr.—The air that entered through drafts and leaks in S.'s app. was only about 20% while the air that enters through leaky covers and masonry in ordinary installations often amounts to 100%. W. SEGERBLOM

The use of acetone in composite engine fuels. R. F. REMLER. *J. Soc. Automotive Eng.* 13, 23-4(1923).—The comparative heating values of acetone and alc. are 13,476 B. t. u. per lb. and 89,477 B. t. u. per gal. for acetone and 13,028 per lb. and 85,985 per gal. for EtOH. Acetone is an excellent motor fuel. Some of its most valuable properties in this respect are its low h. p., high vapor pressure, low f. p. ( $-94.6^\circ$ ), and absence of detonation. It is an excellent blending agent especially for reducing detonation. Its greatest disadvantage is its high cost. D. F. BROWN

Free sulfur in motor fuels, etc. W. R. ORMANDY AND E. C. CRAVEN. *J. Inst. Petroleum Tech.* 9, No. 36, 133-9(1923).—Corrosion and pitting of Cu and, to a less extent, of brass parts of floats, gauze strainers and tubes are generally attributable to the action of elementary S which seems to be present in all of the hydrocarbon fuels on the market (England). Attempts to develop a quant. volumetric method for detg. elementary S were unsuccessful. The following gravimetric method was satisfactory. One hundred cc. of the fuel is shaken vigorously for 10-15 min. with 3 cc. of Hg or until the excess of Hg coagulates. Dil. HCl (1:100) is added, and the mixt. is shaken again to change the HgS to a noncolloidal form. The whole is then filtered under vacuum through a large, wet asbestos plug. Only the HgS is retained by the plug. After thorough washing with dil. HCl, the plug is placed in a beaker, and the funnel washed with concd. HCl (about 25 cc.). The concd. acid and the HgS which it has removed from the funnel are added to the beaker. By adding 0.5 g. of KClO<sub>3</sub> and agitating, the sulfide is oxidized completely to sulfate, which is detd. in the usual way. There seems to be a systematic error of 0.2 to 0.3 mg. of S. Blackening of a Cu strip seems to occur when the S content is slightly over 1 mg. per 100 cc. of fuel. The American naphthas tested contained somewhat less than the Oriental. Blends of naphtha with alc. are of particular interest, since the acidity of the latter renders the metal surfaces more susceptible to corrosion by dissolved S from the naphtha. Bauxite and silica gel remove a small part only of the dissolved S from fuels. The origin of this elementary S is uncertain. W. F. FARAGHER

**Mechanical means for the preparation of coal.** ERNST BLAU. *Chem.-Ztg.* 47, 417-8(1923).—The types and design of machines used in handling coal are compared with those used in dressing ores. The development of machinery for handling, sorting and washing coal is traced. Descriptions, methods of operation, and some results obtained with certain recently constructed machines for handling and washing coal and for making briquets are given.

W. W. HODGE

**Determination of the calorific value of coal.** A. THÜRMER. *Chem.-Ztg.* 47, 421 (1923).—The formula  $81c + Gc$  with deductions of  $-34G/3$  or  $-34G/2$  for certain kinds of high-volatile coals is shown to give approx. results for the low or net calorific value of the coal. A table contg. values of  $a$  for coals with 5-50% volatile matter ( $G$ ), and a comparison of heating values as calcd. from the formula with those obtained by using a bomb calorimeter on samples of 7 different types of coal are given. No definite relation exists between the calcd. and obtained values, some being higher and others lower. The calcd. values are sufficiently accurate for industrial purposes to give a general idea of the value of the coal. Reasons for the differences in calorific value of high-volatile coals when detd. on air-dried and on completely dried samples, and some possible sources of error in detg. the fusing point of the ash are also mentioned.

W. W. HODGE

**Utilization of lignite coal.** H. GORE. *Fuels & Furnaces* 1, 149-50(1923); cf. *C. A.* 17, 2179.—A digest.

D. F. BROWN

**South African coals, with special reference to their nitrogen content.** VERNON BOSMAN AND S. W. PARR. *S. African J. Ind.* 6, 215-25(1923).—This study of S. African coals was planned with a view of obtaining a more fundamental knowledge of the form in which N exists in coals. Fourteen samples were studied, representing nearly as many S. African collieries. Proximate analyses of these gave the following ranges:  $H_2O$  1.28-2.83%, volatile matter 22.29-33.41, fixed C 51.85-68.02, ash 7.96-15.98. The analytical methods were those of Parr (cf. *Chem. Examin. of "Water and Fuel"* 1922). Ultimate analyses of these coals showed the range of S to be 0.42-1.72%, N 1.53-2.32, B. t. u. 11805-13917. Four representative samples of the 14 were distd. from app. specially constructed to insure uniform conditions for the different samples. The quant. yields of coke, tar, ammonia, and gas at temps. of 450°, 500°, 550°, and 600° were detd. The percentage of N in each product of distn. was detd. for each of the 4 temps. A study of these fractions led to the following conclusions: In the distn. expts. carried out between 450° and 600° the percentage of N remaining behind in the coke is distinct for each coal and is independent of the total amt. of N in the coal. As much as 98.85% of the N remained in the coal at 450° in one case. In this instance only 0.05% of the N is liberated as  $NH_4$ . At 600° an av. of 95% of the N remains in the coal and not more than 2.04% of the N is liberated as  $NH_4$ . On further heating to 750° in the presence of steam an av. of 70% of the N remains in the coke. Hydrolyzing agents will affect the  $NH_4$  N in the coal, but not the more stable form. In the coals studied the percentage of  $NH_4$  N varied from 0.57 to 1.6% of the total N present. Usually the greater part of this N was in the amido form.  $SeOCl_2$  forms a colloidal mass with the tar. It does not attack the stable form of N. Strong reducing agents will attack the N in coal to yield  $NH_4$ . Thus red P and HI at 250-280° reduces the percentage of N from 2.05 to 1.5%, calcd. on the moisture- and ash-free basis.

L. W. RIGGS

**The combustion of coal and similar substances in the calorimeter.** WILHELM KOHEN. *Chem.-Ztg.* 47, 184-5(1923).—Modifications of the bomb calorimeter are described with a cut (manuf. by Julius Peters, Berlin). Above the crucible is suspended a mushroom-shaped cover which diverts the flame down and back around the crucible and reduces heat losses. More O is brought in contact with the briquet during ignition by small openings 3 mm. from the bottom of the capsule, giving more complete combustion, and allowing the use of samples of 0.8-1 g. The bomb is of special steel and is not attacked after many detns. Cl and S detns. in org. substances show reliable results.

C. C. DAVIS

**British steel-works gas-producer practice.** FRED CLEMENTS. *J. Iron Steel Inst.* 1923 (advance proof) 15 pp; *Engineering* 115, 597-9.—An exhaustive series of expts. has been conducted on a com. scale to det. relative merits of mech. and non-mech. types of gas-producers. Arrangements were made to obtain the following data: (a) quantity of air blown into producer, (b) quantity of steam used, (c) const. steam satn. temp., (d) definite height of fuel bed, (e) gas analyses which should represent av. conditions, (f) moisture, tar and soot contents of the gas on leaving producer, (g) temp. of outgoing gas, (h) wt. of coal charged and av. samples for analysis. A set of charts is shown on which are tabulated the data obtained. A chart is also shown which summarizes the comparison between the 2 types of plants. While the capital cost of

mech. plant and also repairs, power and stores are somewhat greater, the labor charges and loss of carbon in ashes are considerably less, making cost of operation less than that of a non-mech. plant. The mech. plant occupies smaller ground space but has no spare unit as stand-by. Drawings of several types of producers are shown. H. C. PARISER.

**Determination of the air required for combustion and of the nitrogen content of illuminating gas.** MAURICE NICLOUX. *Chimie et industrie* 9, 866-71(1923).—Two methods are described. (1) To a measured vol. of air in an explosion pipet add a measured vol. of illuminating gas (freed from  $\text{CO}_2$  and  $\text{O}_2$ ) (such as to leave an excess of O after combustion), detonate, and read the vol. of gas after detonation, after absorbing  $\text{CO}_2$ , and after absorbing  $\text{O}_2$  with alk.  $\text{Na}_2\text{S}_2\text{O}_4$ . O in the air — O absorbed = O required for combustion, from which air required is calcd.; and total N (final reading) — N in air = N in gas. The N detn. was checked by means of Pregl's micro-Dumas method and found to give reliable results. Paris gas contains 12.9% N and Strasburg gas 23.5-31.6% N. (2) To a measured amt. of gas add a measured excess of pure  $\text{O}_2$  (a), detonate, read the vol., absorb  $\text{CO}_2$ , read the vol. (b), add a measured excess of  $\text{H}_2$ , detonate, and note the contraction in vol. (c).  $a - (c/2) = \text{O}$  required for combustion;  $b - (c/2) = \text{N}$  in gas. This method is more accurate for N than (1). The technic of all the methods is described in detail. ♦ A. PAPINEAU-COUTURE.

**Calculation of charts for flue gas analyses.** PAUL SCHRIEBER. *Arch. Wärme-wirtschaft* 3, 231-3(1922).—S. describes the theory and construction of various simple charts for detg. excess air and completeness of combustion from flue gas analyses.

ERNEST W. THIRLE

**Air and gas reversing valves.** W. TRINKS. *Fuels & Furnaces* 1, 153-6(1923).—The effect of reversing valves on the design and operation of regenerative furnaces with particular reference to open-hearth furnaces is discussed. Data are given in tabular form on the buoyancy of air as affected by the height of the vertical flue.

D. F. BROWN

**Primary tar.** II. FRANZ SCHÜTZ, WILHELM BUSCHMANN, HEINRICH WISSBACH. *Ber.* 56B, 869-74(1923); cf. C. A. 17, 1321.—The present paper deals primarily with the fraction b. below 75° of the so-called benzine of coal. It consists chiefly of olefins, accompanied by diolefins, cyclic diolefins and paraffins in varying amts. The method of investigation was relatively simple: the action of Br on the one hand, of concd.  $\text{H}_2\text{SO}_4$  on the other, on its sharply defined fractions as possible; the only exception was cyclopentadiene (1), which was converted into dimethylfulvene. The ketones and S compds. were previously removed as completely as possible by mild means. From the various fractions were obtained the following percents of paraffins: Up to 10°, butane, 4; 15-35°, methylbutane, 2.4; and pentane, 5.1; 63°, methylpentane, 13; 68-72°, hexane, 24; 98-102°, heptane, 21; 120-30°, octane, 1. Of the olefins,  $\text{C}_2\text{H}_4$ ,  $\text{C}_3\text{H}_6$ , 1,2- and 2,3-butylene and 1,2-pentene were identified (through their dibromides); of the diolefins 1,2,3,4-butadiene (as the tetrabromide); and of the cyclic diolefins 1 (5-7% of the 40° fraction). The first runnings of the light oil contain  $\text{AcH}$  and  $\text{Me}_2\text{CO}$ ;  $\text{MeCOEt}$  and  $\text{MeCN}$  were obtained in the last runnings of the  $\text{Me}_2\text{CO}$  and the  $\text{C}_6\text{H}_6$  fractions.  $\text{MeSH}$ ,  $\text{Me}_2\text{S}$  and  $\text{CS}_2$  were also identified.

C. A. R.

**Examination of low-temperature coal tars.** II. J. J. MORGAN AND R. P. SOULE. *Ind. Eng. Chem.* 15, 693-7(1923); cf. C. A. 16, 2591; 17, 2487.—In detg. degree of unsatn. of the hydrocarbons of low-temp. tar, consistent results may be obtained with a Hanus soln. contg. slightly more I than Br, if the I:Br, the wt. of sample, the excess of soln. and time of digestion are kept const. However, I Nos. thus obtained are lower than theoretical. When Br/I > 1 substitution reactions give fictitious increases in I Nos. Attempts to sep. aromatics from unsaturates in low-temp. tar as well as to det. amts. of each in presence of the other by  $\text{AlCl}_3$  or  $\text{ZnCl}_2$ ,  $\text{Hg}(\text{OAc})_2$ , and  $\text{H}_2\text{SO}_4$  of various strengths were unsuccessful. In the absence of aromatics, the unsatd. hydrocarbons of low-temp. tar may be recovered fairly pure but not quantitatively by liquid  $\text{SO}_2$ .

J. J. MORGAN

**Crude tar oil.** R. WEISSGERBER AND E. MOHRLE. *Brennstoff-Chem.* 4, 81-4(1923).—The investigation is limited to the oil obtained from anthracite coal which distd. between 200° and 300°. The various fractions had the following compns.: 205-14°, unsatd. combinations (A) 30%, aromatic combinations (B) 50%, paraffin and hydroaromatic combinations (C) 10%; 214-26°: A 26-30, B 52, C 16%; 223-32°: A 26-30, B 50, C 15%; 232-38°: A 25-26, B 50, C 13%; 233-43°: A 20, B 66, C 13%; 243-48°: A 20-23, B 56, C 16%; 253-58°: A 13, B 62, C 14%; 264-71°: A 17, B 66, C 16%. The unsatd. combinations consisted of many double bonded compds. in open and closed chains. Oxidation with cold  $\text{KMnO}_4$  soln. gave a large amt. of  $\text{H}_2\text{C}_4\text{O}_4$ , besides cryst. difficulty sol. carboxylic acids. Aromatic compds. present were pseudo-

cumene, durene, naphthalene,  $\alpha$ -methylnaphthalene,  $\beta$ -methylnaphthalene, and 1,6-dimethylnaphthalene. From the paraffin and hydroaromatic fraction, b. 230–36°, cryst.  $\gamma,\gamma$ -dinitrodiphenyls were obtained, m. 233°, by treatment with fuming  $\text{HNO}_3$ . From another portion of the same fraction by nitration small amts. of cryst. dinitrofluorene sepd., m. 201°. In the fraction b. 235–41° acenaphthene was identified.

C. T. WHITE

**The presence of increased amounts of carbolic acid in tar.** FRANZ SCHÜTZ. *Brennstoff-Chem.* 4, 85(1923).—The yield of carbolic acid from tar may be increased approx. 20 times by thermal decompn. of the fraction b. 205°. The sepn. of phenol from the cresols is made by boiling the mixt. with twice its wt. of benzoyl chloride. The cresyl benzoate formed is sol. at 25° in alc. whereas the phenyl benzoate is only slightly sol. at this temp.

C. T. WHITE

**The presence of ketones, aldehydes, and sulfur compounds in the light oil distillate from crude coal tar.** FRANZ SCHÜTZ. *Brennstoff-Chem.* 4, 84(1923).—The fraction distg. 30–75° contains 14% acetone. Methyl ethyl ketone is present in smaller amt. in the fraction distg. at 85°. Small amts. of acetaldehyde and paraldehyde have been identified in the light oil. S compds. present in the light oil are methylmercaptan and  $\text{Me}_2\text{S}$ .

C. T. WHITE

**Coke and by-products in 1921.** R. S. McBRIDE. U. S. Geol. Survey, *Mineral Resources of U. S.* 1921, Part II, 371–444(preprint No. 33, published June 14, 1923).

E. H.

**A method of making non-fingery coke from bituminous coal high in volatile matter.** K. SHIMOMURA. *Chemistry & Industry* 42, 556–8(1923).—Most coals in Japan are so high in volatile matter (38–40%) that while they yield metallurgical coke in bee-hive oven, in by-product ovens a fingery coke no better than gas coke is produced. A renewed patent has been granted S. for a process by which good metallurgical coke can be produced from these coals in by-product ovens without the addn. of anthracite. Depending on the nature of the coal it is heated in ovens at 300° to 600° until 15 to 25% volatile matter is left in the coal, this product is quenched, and may be ground and washed free from foreign matter. It is then mixed with the bituminous coals in proportions of 20 to 35% of the former and 80 to 65% of the latter. These mixts. when heated in by-product ovens produce good metallurgical coke, comparatively porous if coked at 1000° and of high d. at 1400°. The semi-coal must have at least 15% volatile matter uniformly distributed through the particles or fingery coke will be produced. For successful operation a continuous feed app. has been designed, the main requirements of which are enumerated. Several photographs show the differences in coke produced with and without the use of the S. process. Recovery of low-temp. carbonization oils adds to the value of the process.

W. W. HODGE

**The shell theory of coke formation in the laboratory in the determination of the volatile constituents.** D. J. W. KREULEN. *Chem. Weekblad* 20, 344–8(1923).—Samples of coal were heated in a crucible for definite times, varying from 15 sec. to 5 min., and cooled down suddenly by dipping the crucible into cold water. The coke thus formed consisted in all cases of a number of shells, presenting in cross section the aspect of an onion. Heating for 15 sec. produced only a single, very thin, coherent membrane or shell, the rest of the coal remaining in the form of a powder; after 20 sec. several such shells were formed; after 22 sec. the shells formed a sort of a crater which contained loose powder. On further heating the powder gradually disappeared, one solid shell after the other being formed in parallel layers, until the whole was transformed into a silver-gray cake, consisting of coke layers. The observations indicate that in coke formation in general there is probably some process of melting.

R. BRÜTNER

**Reactivity of coke as a factor in the fuel economy of the blast furnace.** F. R. SUTCLIFFE AND E. C. EVANS. *Engineering* 115, 603–5, 638–40, 664–7(1923); *Iron Coal Trades Rev.* 106, 685–8.—See C. A. 17, 2408.

J. L. WILEY

**Hollow grates and mixtures of coke and coal on them.** O. BINDER. *Wärme & Kälte Tech.* 24, 250(1922).—B. gives summaries of 6 boiler tests which were run with mixts. ranging from pure coal to half coke. With half coke capacity can be kept up only with mech. draft, but the efficiency is the same. The ash did not stick to the hollow grate. This type of grate is very suitable for coke-coal mixts. ERNEST W. THIELE

Motor spirits and ethylite (LAVEDAU) 16. Consistency of road tars (BROOME) 20. "Blummer" benzines (ECKART) 22. The origin of coal (SCHWARZ, LAUPPER) 8. Sweeping changes in government specifications proposed (ANON) [for motor fuels, etc.] 22. The coal fields of Brackles (ESSINGER) 8. Determination of phenols in coal-tar oils and crude carbolic acid (HILL) 7.



LINDEMAN: *Torv*. S. R. 5. Kristiania: H. Aschehoug & Co. Kr. 0.75.  
GRAM, J.: *Unnersokelser over bituminose kul fra Spitzhergen*. S. R. 11. Kristiania: H. Aschehoug & Co. Kr. 1.00.

**Peat fuel for metallurgical use.** KRISTIAN REPSAAS. Norwegian 36,825, Feb. 19, 1923. To facilitate the drying of the raw peat metallic compds. are added as colloid hindring means. If the peat is to be used in a furnace for the reduction of a metal, only salts of the same metal are added to the raw peat in order to avoid contaminating the charge with other metals.

**Recovering ammonia from gases.** H. WIGDERHOLD and C. EHRENBURG. U. S. 1,459,703, June 19. Gas contg.  $\text{NH}_3$ , e. g., a gas of low  $\text{NH}_3$  content, is brought into contact with disintegrated lignite or other crude carbonaceous material contg. org. acidic substances, and the latter is subsequently treated with lime to liberate the absorbed  $\text{NH}_3$  in the free state for recovery and is then treated with  $\text{HCl}$  or other inorg. acid in slight excess to liberate org. acids and reutilized for further  $\text{NH}_3$  absorption.

**Conduit system for removing blast gases from water-gas generators.** H. KNÖFEL. U. S. 1,459,058, June 19.

**Metallurgical coke.** A. H. BAULLE-BARRELLE. U. S. 1,458,964, June 19. In manuf. of metallurgical coke the heating is so effected that at the instant when the surface of the coal is at the temp. of agglomeration  $T^{\circ}$  the center of the mass shall be at the temp.  $T-N^{\circ}$  ( $N$  being approx.  $15^{\circ}$  multiplied by  $1/2$  the thickness of the mass in cm.) and that subsequently the temp. diff. between the surface and the center of the mass shall not exceed  $N^{\circ}$ . Regulation of the heating in this manner produces a strong coke free from cracks.

## 22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

**Fractional distillation of various petroleum under reduced pressure.** J. C. MORRELL AND GUSTAV EGLOFF. *J. Soc. Chem. Ind.* 42, 188-92T(1923).—A comparison of the fractions from several crude petroleum is made when a vacuum distn. app. designed by M. and E. and a 2-l. Engler flask used at atm. pressure are employed. The sp. gr. and percentages of unsatd. substances in the fractions are compared. The viscosities of the lubricating stocks and the percentages of paraffin wax obtained are remarkably better in the case of the vacuum distns. Tables give complete data, including percentage of coke or residuum. A Claisen flask is used in the vacuum distn. process, the secondary neck having a 0.75 in. filling of glass beads to prevent frothing into the condenser tube. This column was heat-insulated by a winding of asbestos cord. The new receiver consists of two graduated cylindrical chambers, connected by a tube contg. a stopcock. The distillate collects in the lower, until it is to be drawn. A 3-way stopcock connects the bottom chamber to the vacuum line or to the atm. The graduations assist in controlling the rate of the distn. The fractions coming over below  $275^{\circ}$  are removed at atm. pressure. Further distn. is effected by reducing the pressure and maintaining a temp. of  $275^{\circ}$  until the rate becomes too low at the lowest attainable pressure. The temp. is then raised gradually to effect as complete distn. as is desired.

W. F. FARAGHER

**Natural gas and petroleum drilling in lower and upper Austria.** ANON. *Petroleum Z.* 19, 613-7(1923).—Drilling operations in Austria are described. Gas has been found in lower Austria analyzing as follows:

Depth of drilling in meters.	$\text{CH}_4$ %	Heavy hydrocarbons %	$\text{CO}$ %	$\text{CO}_2$ %	$\text{N}_2$ %	$\text{H}_2$ %
195	82.2	0.4	0.8	1.5	11.1	1.0
400	29.0	0.7	0.7	6.0	63.5	
555	86.8	0.4	1.1	0.7	11.0	

D. F. BROWN

**Argentine petroleum industry and trade.** ANON. *Petroleum World* 20, 269-73 (1923).—The operation of the 16 companies operating in Argentina is described and production figures from 1907 to 1922 are given. Oil from the Comodoro Rivadavia field is heavy (6.8 hbl. per ton) and distills over 3% to  $150^{\circ}$ , 9.6% at  $150-300^{\circ}$  and 87.4% of heavy residual oil beyond  $300^{\circ}$ . The sp. gr. ranges from 0.922 to 0.940 and yields

of finished products are obtained as follows: naphtha and gasoline 1.5-3.5%, illuminating oils 15-19%, lubricating oils 77-85%. The govt. refinery exts. about 10% as light oils and uses the residue for fuel oil, which has a heat value of about 10,200 cal. Oil from the Mendoza-Neuquen field gave on distn. about 15% naphtha, 27% kerosene for lighting, 10% kerosene (heavy) and gas oil, and the rest as fuel oil residue. Oils from the Salta Jujuy field range from 0.847 to 0.956 in sp. gr., are both asphalt and paraffin base and yield 11-67% of naphtha and light oils. D. F. BROWN

The constituents of the fraction of a Borneo petroleum which distils between 37° and 81°. G. CHAVANNE. *Bull. soc. chim. Belg.* 31, 331-64 (1922).—An examn. of the gasoline showed that all the possible isomerides of hexane are present, as are all the hydrocarbons derived from cyclopentane and cyclohexane the h. ps. of which are included in the fraction investigated. With the exception of ethylcyclobutane, all the cyclic compds. present are derived from five- or six-membered rings. Of the hexanes present, normal hexane is the most abundant, followed by isohexane and  $\gamma$ -methylpentane, while  $\beta,\beta$ -dimethylbutane and  $\beta,\gamma$ -dimethylbutane are present in much smaller proportion. The satd. cyclic hydrocarbons present in quantity are cyclohexane and methylcyclopentane. A no. of phys. consts. are given which differ slightly, if at all, from those in the literature. The crit. temp. of soln. in aniline (cf. Chavanne and Simon, C. A. 13, 2125; 14, 117) and the d. are important factors in the exptl. study of complex mxts. of hydrocarbons (cf. Chavanne and Simon, C. A. 13, 8182). J. C. S.

The Sunburst oil and gas field, Montana. DORSEY HAGER. *Trans. Am. Inst. Mining Met. Eng.* 1218-F, 19 pp. (1923).—The Sunburst dome consists of several highly productive areas closely connected. The present commercial production is from the Kootenai and Ellis horizons in Jurassic beds. The crude oil from Kootenai sand is 36.3° Bé, yielding 28.0% gasoline, 6.0% engine distillate, 15% kerosene, 10.0% gas oil, 43.0% fuel residue. The Ellis crude ranges from 29° to 38° Bé; it has furnished 37.5% gasoline and 23% kerosene. The crude contains 0.5 to 1.5% S. A detailed account is given of general stratigraphy, geological structure and economic conditions.

E. T. ERICKSON

Physico-chemical significance of flash-point temperatures. W. R. ORMANDY AND E. C. CRAVEN. *J. Inst. Petroleum Tech.* 9, No. 35, 33-68 (1923); cf. C. A. 16, 1147, 2219.—The vapor-pressures of pure heptane, toluene and EtOH (99.8% and 95.0% by vol.) were measured over the temp. range -40° to +20°. The app. used was of the barometric-tube type, provision being made for removing permanent gases. The values detd. agree well with the best published data. The glass flash-point app. described in a previous paper (*l. c.*) was modified for use at reduced pressures (as low as 200 mm.). A special app., which is described, was constructed for detg. flash points at pressures up to 6 or 7 atm. At atm. pressure, the flash-points found in the latter app. were a few degrees lower than those measured in the glass app., a result, probably, of the higher liquid:air ratio. The effects of quantity of liquid and dissolved gases are discussed fully. The explosion limits of the vapors in O and CO<sub>2</sub> were measured. Graphs and tables present the results. Ignition temps. are discussed critically. W. F. FARAGHER

Physical and chemical investigations of "Blummer" benzines. HANNES ECKART. *Brennstoff-Chem.* 4, 85-8 (1923).—Results for sp. gr., viscosity, surface tension, calorific value, and  $n$  are given for various benzines obtained from petroleum and from brown coal. C. T. WHITE

Removal of carbon from liquids. J. B. HILL. *Chem. Met. Eng.* 28, 1077 (1923).—In gasoline recovery from dry cleaning, it is well to add the decolorizing C before removal of the dirty soap. This causes the bulk of the C to settle out and the settled liquid treated with NaOH carries the fine C down with the gelatinous soap ppt., leaving a perfectly clear gasoline. W. H. BOYNTON

A study of the bituminous shales of Bourbon-St. Hilaire. H. GAULT AND L. BOISSELET. *Mat. grasses* 15, 6466-70 (1923).—The shale contained H<sub>2</sub>O 1.63, ash 66.50, coke (by diff.) 8.87-17.57, volatile 15.30-24.00, C 22.14, H 2.26, N 0.57, total S 3.46, volatile S 2.64, non-volatile S 1.29, CHCl<sub>3</sub>-sol. bitumen 1.64%. The yield of crude oil is max. at about 500° (9.6), decreasing with higher temps. with increase in yield of gas. Max. yield of (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> (12.0%) is obtained at 800°, with superheated moist air or steam. Distn. should be carried out in 2 stages: (1) distn. proper to 500°, with or without steam, (2) gasification with superheated air or steam at 800° to obtain NH<sub>3</sub>. A. PAPINEAU-COUTURE

Researches on shale. BROR HOLMBERG. *Inginiörvetenskapens Akademiens Handlingar* 6, 88 pp. (1922); *Chem. Zentr.* 1922, IV, 82.—A monograph on dry-distd. Swedish shale oil, especially the cement-shale benzine from Schonen, the behavior of which toward reagents is described, with extn. expts. with alum shale by various methods

and the action of heat on shale bitumen. The work is replete with exptl. data.

C. C. DAVIS

**The bituminous marl of Ismid, Asia Minor.** F. HANSGIRG AND B. SANDER. *Petroleum Z.* 19, 576-85(1923).—A geological and geographical description of the bituminous deposits in this region is given. There are 3 types of marl formation, bare marl, oil marl and oil shale. The location, depth, area, etc., of each type are discussed in detail. An exptl. *retort* is described by which the bituminous and asphalt content of the various layers were detd. The shale gave on distn. about 10% of gas composed of CO<sub>2</sub> 48, unsatd. hydrocarbons 5, H<sub>2</sub> 40, CH<sub>4</sub> 2 and air 5%. It had a heat value of 5000 cal. The oil solidified at 45° because of its high content of paraffin. Asphalt of m.p. 105° was obtained from the dephlegmator products. This is a bright, hard asphalt of sp. gr. 0.84, viscosity at 50° of 3.4, flash 80° and is analogous to the best natural asphalt. The crude oil was sepd. by steam and vacuum distn. into the following fractions:

No.	Yield %	Sp. gr.	Viscosity.	Flash °	Burning pt.
1	30	0.820 (20°)	1.3	53	70
2	24	0.850 (100°)	1.2 (100°)	155	190
3	14	0.890	1.9 (100°)	208	230
4	16	0.910	2.3 (100°)	240	320

Residue 13%, loss 3%. 15% of paraffin of m.p. 61.3° was obtained from the crude oil by the Holde method. Distn. of the deparaffinated crude oil gave the same fractions as above but with higher sp. grs., viscosities and flash points for all fractions except the first (30%) fraction, which had a flash of 48°. It is claimed that com. distn. would yield asphalt (before distn.) 2, benzine 10, kerosene 14, gas oil 18, light lubricating oil 12, heavy lubricating oil 15, paraffin 12, asphalt residue 7 and loss 10%. D. F. BROWN

**Norfolk shales and the fusion retort.** J. F. W. PASLEY. *Petroleum Times* 9, 790(1923).—Criticism of previous article, cf. *Ibid* 729-30. The advantages of the fusion retort are set forth.

D. F. BROWN

**Retorting Norfolk shale.** J. DAY. *Petroleum Times* 9, 840(1923).—See preceding abstr.

D. F. BROWN

**Macro- and micro-methods of ultimate analysis of bituminous shales.** H. GAULT, MAURICE NICLOUX, G. PFERSCH AND R. GUILLEMET. *Mat. grasses* 15, 6461-6(1923).—In macro-analysis the most important factors are sampling, temp. and time of combustion. In the detn. of C accurate results could be obtained only in quartz tubes at a white heat, by burning for 4-5 hrs., and using O for combustion. Much more concordant results were obtained for H. In micro-analysis satisfactory results for C were readily obtained on 5-10 mg. of shale by burning at dull red heat for about 30-35 min. Larger quantities of sample gave low results. For H, the portion of the tube contg. the Pt boat should be heated to bright redness, and the amt. taken should contain about 3-5 mg. of org. matter. Quite possibly some of the published analyses of bituminous shales and other solid fuels are incorrect. Micro-analysis is far simpler and more accurate for this kind of work.

A. PAPINEAU-COUTURE

**Permanence of emulsions formed by sea water and mineral oils with the addition of varying amounts of rape oil.** ROSNER. *Petroleum Z.* 19, 611-2(1923).—Expts. are described in which light and heavy cylinder oils were mixed with varying amts. of blown rape oil and emulsified with an equal amt. of sea water. It was found that with less than 1% of rape oil noticeable amts. of water settled out on standing at room temps. for 24 hrs. With larger amts. of rape oil very little or no water settled out and the emulsions were sufficiently permanent for use in marine engines.

D. F. BROWN

**Method of expressing the value of mixing agents between hydrocarbons and alcohol (95% by volume).** W. R. ORMANDY AND E. C. CRAVEN. *J. Inst. Petroleum Tech.* 9, No. 26, 129-32(1923).—Heptane was employed as a standard hydrocarbon in making mixts. with alc. By replacing a small part of the alc. with a mixing agent, the temp. of miscibility was altered. It was found that this change, *Gr. t.*, was approx. proportional to the vol. of mixing agent added, and inversely proportional to the vol. of alc. originally present. The formula proposed is  $Gr. t. = K M/A$ , where *K* is the proportionality factor, *M* the percentage by vol. of mixing, and *A* the percentage by vol. of alc. originally present. The proportionality factor, which might be called the mixing value of the agent, is positive if the sepn. temp. is lowered by the agent, and the agent is then a promoter of complete soly. Although the values of *K* for a mixing agent vary somewhat in solns. of varying compn., the av. value gives a good idea of the worth of the agent for practical purposes. The values of *K* might be expressed as a "water value" by taking the ratio of the differences of the sepn. temps. for equal percentages

of mixing agent and  $H_2O$  when using the same heptane-alc. soln.  $K$  for cresol is 123, the water value for cresol being about 0.12, since when 1 cc. of water is added to a given soln. of heptane and alc., about 8 cc. of cresol must be added to prevent change in the temp. of complete miscibility ( $1/8$  or 0.12+). No substance so far examd. is more than 0.2 as effective in preventing sepn. as water is in effecting it. The most effective agents have a hydrocarbon nucleus with an OH group or groups. A table of  $K$  values for a list of substances is included.

W. F. FARAGHER

**The use of aluminium chloride in cracking.** L. REISS AND I. EPSTEIN. *Refiner & Nat. Gasoline Mfr.* 2, No. 6, 6-8(1923).—The work of earlier investigators in this field is summarized and the theories involved in the use of  $AlCl_3$  as a catalyst are discussed. The quality of oil obtained by treating with  $AlCl_3$  is compared with that obtained by other processes and claimed to be superior and requires no subsequent treatment except for removal of the catalyst. The greatest obstacle is in obtaining cheap  $AlCl_3$ .

D. F. BROWN

**Control of evaporation.** C. P. BUCK. *Petroleum Age* 12, No. 1, 16-8(1923).

D. F. BROWN

**Contribution to the researches on benzine and benzene.** HANS WOLFF. *Chem.-Ztg.* 47, 421-2(1923).—This is a discussion of a paper by J. Pritzker and R. Jungkunz (*C. A.* 17, 2188). Reply. *Ibid* 422.—A number of references are given. W. W. H.

**Sweeping changes in government specifications proposed.** ANON. *Nat. Petroleum News* 15, No. 27, 22-5(1923).—The proposed changes in govt. specifications for motor fuels, burning and fuel oils, and lubricants are given in detail. D. F. BROWN

**Survey of Pacific Coast petroleum products. II. Lubricating oils.** E. C. LANE AND N. P. LÉJEUNE. U. S. Bur. Mines, *Repts. Investigations* No. 2482, 26 pp.(1923); *Nat. Petroleum News* 15, No. 27, 51-7, No. 28, 93-4, 102(1923).—Seventy-six samples of com. oils and refinery lubricating-oil stocks were examd. by the methods of the U. S. Interdepartmental Comm. on Petroleum Specifications (U. S. Bur. Mines, *Tech. Paper* No. 323; *C. A.* 17, 1323), to det. whether or not the specifications of the Interdepartmental Comm. (*i. e.*) discriminate against Californian lubricants as a class. Nine samples of oil from Gulf Coast (Texas) crude petroleum were examd. for comparison, and total S contents were detd., although these values are not used in the specifications. Most of the Californian oils fail to meet the demulsibility and emulsification requirements. Many of them fail also to pass the org. acidity specification. Since many of the oils tested are being used with satisfaction for some purposes, the specifications may discriminate unfairly against them. The question of the relationship between emulsion and demulsibility tests, and behavior in service is not fully understood in all cases. Tables showing all results obtained are presented.

W. F. FARAGHER

**Testing oiliness by friction-testing machines.** W. H. HERSCHEL. *Chem. Met. Eng.* 28, 302-3(1923).—A discussion of methods which have been suggested for measuring oiliness, with the factors involved in the friction-testing machine. E. C. B.

**Friction testing of lubricating oils.** W. H. HERSCHEL. *Chem. Met. Eng.* 28, 594-8(1923).—The results are reported of an extensive series of tests in an investigation of the possibility of measuring oiliness with a journal oil friction testing machine, being shown in curves where the coeff. of friction is plotted against Sommerfeld's criterion  $S$  (*cf.* preceding abstract). **Conclusions:** (1) There is little probability that a journal friction testing machine will ever prove convenient for testing oiliness, because the clearance changes with wear; and (2) there is no exptl. evidence that the value of Sommerfeld's criterion at the point of min. friction varies with the oiliness. Similar investigations of other workers are discussed, with references. C. B. EDWARDS

**Viscosity.** R. BOAN. *Chem. Eng. & Mining Rev.* 15, 297-9(1923).—Viscosities of lubricants should be expressed in abs. units, if the coeff. of friction is to be calcd. B. describes a const.-pressure viscometer similar to one described by W. Stone.

EUGENE C. BINGHAM

**Sulfo-acid hodies in lubricating oils.** G. L. OLIENSIS. *Ind. Eng. Chem.* 15, 690-3(1923).—The superiority of the Conradson emulsion test for detecting the presence of so-called sulfonated hydrocarbons in lubricating oils is asserted. W. F. F.

**Examination of cutting-oils (soluble cutting-oils).** KARL BRAUN. *Chem.-Ztg.* 46, 1016-7(1923); *cf.* Kaleta, *C. A.* 16, 4077.—The method of Kaleta is unnecessarily complicated, a modified Höning-Schmidt method, which is described, being preferred. The detn. of free alkali as described by K. is inaccurate. W. F. FARAGHER

**Consistency determination of greases.** C. B. KARNs AND O. L. MAAG. *Ind. Eng. Chem.* 15, 716(1923).—Consistency of lubricating greases is measured by finding the depth of the impression made by a standard ball after falling through a fixed height.

For hard greases, the impression is made by a standard pin which receives the impact of the ball. The app. is described briefly. W. F. FARAGHER

**Examination of axle and journal greases.** TH. KALETA. *Chem.-Ztg.* 47, 183-4 (1923).—As a preliminary test, 100 g. of the grease is weighed into a distg. flask, connected to a plain glass-tube air condenser ( $1 \times 40$ -50 mm.). The grease is melted cautiously and then distd. The fraction below  $240^\circ$  is collected separately. Dista. is continued until decompn. of soaps begins as evidenced by heavy vapors and glowing of the bottom of the flask. The fraction below  $240^\circ$  contains the water and tar oils or light mineral oils. The higher boiling fraction is seldom present. The residue in the flask may be graphite, pitch, asphalt, resin and soap. Other mineral substances used as fillers are sometimes present. Insoly. in alc. is used to prove the presence of mineral oil only in the distillate. Alc. dissolves tar oils, but must be bot to dissolve all of the anthracene. Tar oils in the presence of mineral oils are detected by dissolving a known wt. (5-10 g.) of the distillate in petroleum ether (100 cc.). This soln. is shaken first with 50 cc. of  $\text{Me}_2\text{SO}$ , and then with 20-cc. portions until practically no more tar oils are removed (i. e., until the lower layer is only slightly discolored). Mineral oil is detd. by evapg. the petroleum ether. For analysis, 1-3 g. of the grease is heated in a 100-cc. beaker with 60 cc. of  $\text{C}_6\text{H}_6$ . The boiling  $\text{C}_6\text{H}_6$  is poured through a weighed filter into a 250-cc. Soxhlet flask. In the presence of much soap the first extn. is made with a 1:1 mixt. of  $\text{C}_6\text{H}_6$  and alc. The filter is washed with boiling  $\text{C}_6\text{H}_6$ , dried and weighed. Graphite and inorg. materials remain on the filter. These may be detd. by burning the filter in the usual way. The  $\text{C}_6\text{H}_6$  is evapd. from the filtrate, and the residue treated with boiling petroleum ether. Upon allowing to cool and stand, asphalt, pitch, etc., ppt. The soln. is filtered and run into a Soxhlet flask, the flask and filter being washed 6-8 times with cold petroleum ether. The insol. material in the filter is dissolved in  $\text{C}_6\text{H}_6$  and weighed after evapn. of the  $\text{C}_6\text{H}_6$  as usual. The filtrate from the asphalt is evapd. to dryness and then boiled with 100 cc. of acetone. Upon cooling, the soap ppts. The acetone soln. is poured through a filter into a flask, and the soap washed with cold acetone. Any soap in the flask and that on the filter can be dissolved in bot  $\text{C}_6\text{H}_6$ -alcohol (9:1). This soln. is evapd. to dryness so that the soap can be weighed. Soft asphalt contaminates the soap sometimes, so the  $\text{CaO}$  in the soap should be detd. by ashing and pptg.  $\text{Ca}$  oxalate, as usual. The residue after evapg. the acetone from the last filtrate is tar oil, mineral oil and resin. The mineral oil is sepd. as described above. W. F. FARAGHER

The extraction of small branches of the pine and fir with several solvents. OSSIAN ASCHAN AND OSK. RANTALAINEN. *Brennstoff. Chem.* 4, 101-3 (1923).—An extn. of branches of the pine and fir, 2-10 mm. in diam. was made. The samples were dried for 2 weeks in a warm room and the bark was removed. The wood and bark were broken up and extd. separately with  $\text{Et}_2\text{O}$ ,  $\text{C}_2\text{H}_5\text{OH}$ , and  $\text{H}_2\text{O}$ . The results in % are given as follows; pine, woody part;  $\text{Et}_2\text{O}$  ext., 7.87,  $\text{C}_2\text{H}_5\text{OH}$  (96%), 4.19,  $\text{H}_2\text{O}$ , 3.55; bark;  $\text{Et}_2\text{O}$ , 19.58,  $\text{C}_2\text{H}_5\text{OH}$ , 14.76,  $\text{H}_2\text{O}$ , 13.27. Fir, woody part;  $\text{Et}_2\text{O}$ , 4.4,  $\text{C}_2\text{H}_5\text{OH}$ , 2.12,  $\text{H}_2\text{O}$ , 2.45; bark;  $\text{Et}_2\text{O}$ , 10.66,  $\text{C}_2\text{H}_5\text{OH}$ , 14.22,  $\text{H}_2\text{O}$ , 13.43. The exts. are dark brown semi-solid products which are hygroscopic. C. T. WHITE

Production of H by the thermal decomposition of oil (WEAVER) 18. The law of the relation between the viscosity of liquids and the temperature (VOGEL) 2.

BRUNNER, RICHARD: *Manufacture of Lubricants, Shoe Polishes and Leather Dressings.* 3rd English ed. revised and enlarged. London: Scott, Greenwood. 252 pp.

KISSLING, RICHARD: *Das Erdöl, seine Verarbeitung und Verwendung.* 2nd Revised and enlarged ed. Halle (Salle): W. Knapp. 140 pp.

ROSSMÄSSLER, F. A.: *Verarbeitung des Naphthas oder Erdöles auf Leucht- und Schmieröle.* 2nd Ed. revised and enlarged. Vienna and Leipzig: A. Hartleben.

Distilling and cracking petroleum oils. N. V. S. KNIBBS. U. S. 1,459,156, June 19. Petroleum oil or similar material is cracked by permitting a spray or mist of the material to descend through a cracking tower in direct contact with a current of ascending hot gases produced by the combustion of the less volatile residues of the process.

Shale oil. W. K. KIRBY. U. S. 1,458,983, June 19. A proportioned charge of finely divided oil shale and an entraining oil of high b.p. is caused to flow in a stream of restricted cross-section through a retorting zone heated sufficiently to liberate oil vapors from the shale.

**Treating acid sludge.** O. BEZANSON. U. S. 1,459,084, June 19. Acid sludge from petroleum refining is injected or sprayed with air into a chamber heated sufficiently to decompose the sludge and liberate its S content as  $\text{SO}_2$ .

**Apparatus for cracking oils under pressure.** W. B. D. PENNIMAN. U. S. 1,459,515, June 19.

## 23—CELLULOSE AND PAPER

CARLETON R. CURRAN

**Contributions to chemistry of wood cellulose. II. Nature of wood cellulose.** LOUIS E. WISS. *Ind. Eng. Chem.* 15, 711-3(1923); cf. *C. A.* 16, 1664.—Brief recapitulation of the exptl. work of a no. of investigators, used to evolve a constructive working hypothesis on the nature of wood cellulose. The cellulose aggregate is composed of a relatively large no. of small units held together by secondary valences. Adsorption, swelling, mercerization, etc., are due to disturbances in the secondary valences, whereby the surface area is increased by partial sepn. of the units from one another. In hydrolysis, acetolysis, oxidation, etc., the primary valences are attacked and the unit itself is broken down. The cotton cellulose aggregate consists entirely of cellulose units, while the wood cellulose aggregate consists largely of cellulose units with some non-cellulose units, probably units of carbohydrates adsorbed by the cellulose during the growth of the cell.

**The preparation of standard cotton cellulose and the proposed methods of analysis.** HAROLD HIBBERT, et al. *Ind. Eng. Chem.* 15, 749-51(1923).—Report of Committee of Cellulose Div. of the Am. Chem. Soc. describing in detail the procedure proposed for the prepn. of a "standard cotton cellulose" for research purposes and the methods proposed for its analysis.

**Classifying sulfite cellulose.** PRODUCER. *Svensk Pappers Tid.* 26, 226-7(1923).—It is suggested that sulfite cellulose be classified in some other way than by the lignin content. On the ground of quality the terms normal and unbleachable, normal and bleachable, and normal and easily bleached are suggested.

**The Rinman system for working cellulose and chemical products.** E. L. RINMAN. *Svensk Pappers Tid.* 26, 158-62(1923).—The Rinman system for sulfate pulp differs from others in the method of digesting and in the working up of the waste liquors. The use of soda liquor alone instead of soda liquor and  $\text{Na}_2\text{S}$  obviates foul odors. The chips are treated at 90-100° with the dil. black liquor which later will be used in the digester and then with the white liquor. During digesting the temp. is raised only fast enough to dissolve the incrustations. Longer time and lower temps. are used than normally. Waste liquors are of 2 kinds, black liquor and a mixt. of black liquor, white liquor and lime called lime liquor. From 7000 l. of the former 4800 kg. of  $\text{H}_2\text{O}$  are evapd., leaving 2300 kg. of 32° Bé. black liquor, and from 5860 kg. of the latter 1890 kg. of  $\text{H}_2\text{O}$  are evapd., leaving 4000 kg. thick liquor for dry distn. Each ton of raw pulp yields 25-30 kg. MeOH, 16-20 kg. acetone, 16-20 kg. MeEt ketone, 18 kg. ketone oils and 50 kg. heavy oils. This method gives the same yield of cellulose as the usual sulfate method and 50% more side products with only a slightly increased cost of production.

**The possibility of obtaining more fractions in continuous distillation.** E. OMAN. *Svensk Pappers Tid.* 26, 223, 238-41(1923).—Swedish and German app. for continuous fractional distn. of sulfite liquor are compared. The possibility of getting more than 2 fractions and the limits within which they may be obtained are discussed. Three cuts, 5 graphs, and 7 tables show the arrangement of shelves, the % of MeOH on each shelf with reference to the shelf below, and the min. MeOH content for varying percents of MeOH in the total distillate.

**Evaporation of waste liquor in cellulose plants.** K. L. THUNHOLM. *Svensk Pappers Tid.* 25, 345-6(1922); cf. *C. A.* 16, 4345.—A résumé of these phases of evapn. of waste liquor: the formation of scum, use of horizontal heating surfaces, efficiency of the scrapers, accessibility of the app., steam speed and compression. The exact rise of the b. p. when evapg. waste liquor depends upon whether sulfate liquor, neutralized sulfite liquor or non-neutralized sulfite liquor is used.

**Evaporation of waste liquor in cellulose plants.** E. WIRTH. *Svensk Pappers Tid.* 26, 10-1(1923); cf. preceding abst.—The advantages and disadvantages of horizontal and of vertical heating surfaces are compared with special reference to the temp.

**Action of bacteria on cellulosic material.** A. H. LYNN, et al. *Paper Makers'*

*Monthly J.* 61, 234-5.—Discussion at Annual meeting of London Section of Soc. of Chem. Ind. on industrial applications.

The action of concentrated hydrochloric acid on different celluloses. E. C. SHERRARD AND A. W. FROHLKE. *J. Am. Chem. Soc.* 45, 1729-34(1923).—Curves showing the sp. rotation for cellulose from spruce, yellow birch, Douglas fir and cotton, in soln. in 41% HCl exhibit marked differences, indicating a difference in either the primary or the secondary reactions, which in turn would point to a difference in the celluloses. The optical method is of little value for detg. the quant. conversion of cellulose to sugar.

A. PAPINEAU-COUTURE

Rosin sizing. G. BELLE. *Papeterie* 45, 366-70, 481-4, 522-9(1923).—A review.

A. PAPINEAU-COUTURE

Behavior of the principal celluloses toward iodine and dyestuffs. J. HUBNER AND J. N. SINHA. *J. Soc. Chem. Ind.* 42, 255-60T(1923); cf. *C. A.* 16, 2987.—Absorption tests were made on purified cotton cellulose, linen, bleached and unbleached sulfite, and soda pulps, mech. wood pulp, jute, straw and esparto, with I, methylene blue and methanil yellow solns. Lignocelluloses and unbleached celluloses from lignocelluloses gave the highest, while bleached cotton, linen, and purified sulfite celluloses gave the lowest absorption figures. A relation exists between absorption figures and moisture content in lignocelluloses, while in bleached celluloses no relation exists, but I and dyestuff absorption figures agree well. Treatment with 17.5% NaOH does not affect absorption. Repeated treatment of all celluloses with I, and 17.5% NaOH followed by steam distn. produced  $\text{CHI}_3$  in the distillates.  $\beta$ -Cellulose gives more  $\text{CHI}_3$  than  $\alpha$ -cellulose.

W. H. SWANSON

Washing sulfate pulp in diffusers. T. SAMSON. *Svensk Pappers Tid.* 26, 60 (1923).—Diagrams are given for washing sulfate pulp in diffusers set up in circles of 5, 7 or 9 circular diffusers so that each gets the same amt. of washing.

W. SÖGERBLOM

Apparatus for evaporating sulfite liquor. B. THORBJÖRNSON. *Svensk Pappers Tid.* 25, 368-70(1922).—A new app. for continuous evapn of sulfite liquor is described. It has no movable parts. Data for 3 trials are given leading to transmission coeffs. of 4650, 4880 and 5080, resp. All parts of the app. in contact with steam must be of Cu, acidproof metal or cast Fe. Steel tubes are of short life for continuous evapn. Other parts may be of sheet Fe lined with acid-proof masonry.

W. SÖGERBLOM

Investigations on acidproof metal for digesters. E. HÅKANSON. *Svensk Pappers Tid.* 26, 115-8(1923).—The properties of acidproof metal which establish its suitability for digester parts have been investigated between 18 and 325°; 4 diagrams give the results.

W. SÖGERBLOM

Casein and its modification by acid (from a paper making standpoint). E. SUTHERMEISTER. *Paper Ind.* 5, 1224-8(1922).—S. investigated  $\text{AcOH}$ ,  $\text{H}_3\text{PO}_4$ ,  $\text{H}_2\text{SO}_4$ , lactic acid,  $\text{HCl}$ ,  $\text{H}_3\text{PO}_4$ , and  $\text{HCl}$ ,  $\text{AcOH}$  and  $\text{HCl}$ , lactic acid and  $\text{HCl}$ , and naturally soured caseins. He detd. soly. in  $\text{Na}_2\text{B}_4\text{O}_7$ , adhesive strength, viscosity,  $\text{H}_2\text{O}$ , and ash, and investigated treatment with acids. A  $\text{HCl}$  casein can be made to give as satisfactory results as a naturally soured one; it is probably the amt. of acid used in pptn. rather than the kind that detd. the quality of the casein. The difference in behavior between acid-pptd. and naturally soured casein depends on the ash content of the former. This can be reduced by suitable acid treatment to the same value as that of naturally soured casein. By properly adjusting the amt. of acid used, the pptn. of the casein from the milk and its acid treatment can probably be carried out in the same operation, and the logical place is in the casein factories. If necessary it can be done in the paper mill, and if mechanical losses are avoided in doing this, the casein as usually weighed out could be treated with acid, and, after washing, cooked up to the normal vol. without considering the loss in the process.

A. PAPINEAU-COUTURE

Routine methods for the examination of wood pulp adopted at the Forest Products Laboratories of Canada. E. P. CAMERON. *Pulp Paper Mag. Can.* 20, 2011-5(1922).—A detailed description of the methods used for the detn. of fiber length, strength (beaten and unbeaten), bleaching (bleach consumption and loss in wt.), and color.

A. PAPINEAU-COUTURE

Study of Indo-China plants possibly suitable for paper making. L. VIDAL AND M. ARIERT. *Bull. sci. pharmacol.* 30, 229-41, 297-305(1923).—See *C. A.* 17, 2503.

L. W. RIGGS

Drying of paper. F. GREWIN AND K. LINDERSTAM. *Svensk Pappers Tid.* 26, 143-9(1923).—Several equations covering moisture and heat relations in drying paper and 5 graphs recording data obtained are given together with a résumé of desirable conditions.

W. SÖGERBLOM

Heat economy in drying paper and cellulose. H. RYDGREN. *Papir-Journalen*

10, 89-92, 95-102, 109-11, 116-8, 123-5(1922).—These phases have been investigated minutely: drying machines (with diagrams), effect of summer and winter temps., loss of heat through walls and roof, ventilation, passage of heated air over the drying machines, dimensions of pipes, heat batteries, intake of air, loss of heat in the chimney, use of waste heat and use of condensed  $H_2O$ . Curves and equations are included.

W. SEGERBLOM

**Tearing test for paper.** B. ANDERSON. *Svensk Pappers Tid.* 25, 405-6(1922).—An original app. used in Vasteras is described with cut. It is graduated in kg. cm. The sp. tearing work,  $R$ , is calcd. from  $R = Ru/l.n.\Delta$  in kg. cm. per sq. cm., where  $Ru$  is the tearing work read from the scale,  $l$  is the length of the strip of paper tested,  $n$  is the number of parallel strips, and  $\Delta$  is the thickness of the paper, all expressed in cm.  $R/10$  times the sp. gr. = the tearing surface, the area of free hanging paper whose wt. will cause the paper to tear. A table shows the variable effect of temp. W. S.

**Report of the paper testing committee on the tearing test of paper.** S. D. WELLS. *Paper Trade J.* 76, No. 26, 49-53(1923).—Results obtained by 16 testing stations (14 with Elmendorf, 1 with Witham, and 1 with Eastern Mfg. Co. testers) on 12 sets of samples are tabulated and commented on. With the Elmendorf tester the factors influencing the tests seem to be related to variations in the paper rather than in the instrument. Possible causes for undue variations are discussed, and recommendations for obtaining max. concordance of results are made. A. PAPINEAU-COUTURE

**Bibliography of paper making for 1922.** C. J. WEST AND A. PAPINEAU-COUTURE. *Paper Trade J.* 76, No. 16, 49-52; No. 17, 53-6; No. 18, 53-6; No. 19, 52-6; No. 20, 48-50; No. 22, 55-8; No. 23, 62-4; No. 25, 54-6; No. 26, 48(1923). A. P.-C.

**Destruction of paper by writing ink.** W. HERZBERG. *The Paper Maker's Monthly J.* 61, 236-7(1923); cf. C. A. 17, 1329.—Tests were made by allowing 1 cc. of the ink to flow down a sloping piece of paper and drying the ink at 50-60° for several hrs. Inks, both ancient and modern contg. a large amt. of ferric salts caused the greatest deterioration. Colloidal  $Fe(OH)_3$  soln. free from acid had the same effect. Sizing tests by the ink line method showed the effect of the ink after storage for several years.

FRANCIS G. RAWLING

**Colloid studies in the rosin sizing of paper.** RUDOLF LORENZ. *Papierfabr.* 21, 221-5, 229-35, 241-8, 253-9, 265-8, 273-6(1923).—A brief monograph on rosin is given, with especial reference to its use for paper sizing. The fundamentals of colloid chemistry are covered as far as they relate to the colloid nature of rosin sizing. The concept of Paul, that there is a series of abietic acids with different contents in colloidal water, is confirmed. His conclusion, however, that these hydrate combinations can be treated as stoichiometrical const., was not found true. The striking change in the physical nature of dispersed rosin owing to slight increases in temp. is the explanation offered for the sizing troubles incident to operating with hot stock in the beater. When abietic acid- $AcOH$  soln. is cooled, a coarsely dispersed sepn. does not occur at once, but after an hr. a typical colloid is obtained. von Veimarn's rule, that with extreme concns. a ppt. occurs in a very finely divided form, and with moderate concns. a coarse ppt. occurs, was observed with abietic acid hydrosol. Also the cryst. nature of the colloid phase, assumed by von Veimarn, was occasionally recognized. The peptizing action of hydroxyl ions on rosin size was studied, as well as its colloidal characteristics by means of colloid-chem. methods. Sodium resinate soap in  $H_2O$  occurs within the limits of the mol. and the colloid states, and only in very concd. solns. does it assume the emulsoid state. "Free rosin" is identified as a typical suspension colloid with a negative charge. "Size milk" is a free rosin hydrosol, peptized by the resinate or hydroxyl ions. Surface tension-concn. curves of rosin size solns. of varying alkali content are sketched and described, and their practical use is demonstrated. A very exact control of the manuf. of rosin size can be exercised by means of the drop count test. By these tests, the amts. of total and free rosin in size milk can be detd. Under "dynamics of rosin sizing," the equil. changes occurring in the beater during sizing are considered. The pptg. actions of a number of salts on the abietic acid hydrosol are tabulated. With increasing charge on the cation, there is an increase in flocculation intensity; on the other hand, the anions exert a peptizing action. The effect of impurities in the  $H_2O$  on sizing is shown. The positively charged  $Al(OH)_3$  acts as an "electrostatic adhesive" with the negatively charged fibers and rosin, thereby producing an isoelectric state. J. L. PARSONS

**Bleach studies on wood pulps.** II. C. G. SCHWALBE AND HERMANN WENZL. *Papierfabr.* 21, 268-70(1923); cf. C. A. 17, 2190.—During bleaching  $CO_2$  is evolved, amounting to 0.28-0.28 g. per 100 g. of pulp when treated with 1 g. of  $Cl_2$ . This leads to the formation of  $Ca(HCO_3)_2$  and, consequently, a depression in the  $H$ -ion concn., thus slowly bringing the bleaching process to a standstill. By heating the bleach bath



to 30–35° and by subjecting the stock to a vigorous movement, the soly. of the  $\text{CO}_2$  is considerably decreased, the formation of the deleterious  $\text{Ca}(\text{HCO}_3)_2$  prevented and the bleaching action accelerated. An air blast has only a mechanical effect in that it removes the  $\text{CO}_2$ .  
J. L. PARSONS

Degree of dissociation and unsaponifiable matter in rosin size. -A. HAUG. *Paper Trade J.* 76, No. 26, 45–8(1923).—See C. A. 17, 1329, 1716. A. PAPINHAU-COUTURE

The Ljungstrom air heater and its use in the paper and cellulose industries. F. LJUNGSTROM. *Svensk Pappers Tid.* 26, 168–76(1923).—The description and use of this air heater is accompanied by 32 cuts, diagrams, graphs and tables showing its construction and the saving gained by its use. It is designed especially for sulfite cellulose plants.  
W. SEGERBLUM

Determination of lignin in wood (EULER) 7. Lignin (HEUSER, WINSVOLD) 10.

SCHWARZ, RICHARD: Die technische Herstellung von Zellstoff. Halle (Salle): W. Knapp. 115 pp.

Treating cellulose with caustic soda and carbon disulfide. C. F. CROSS and E. J. BEVAN. U. S. 1,459,616, June 19. Fibrous cellulose, e. g., raw cotton fiber, is treated with a 6–11% soln. of  $\text{NaOH}$  and then with  $\text{CS}_2$  at ordinary temp. and finally washed with a strong brine. The product is fully hydrated and possesses good plasticity.

Sampling-cock for cellulose hollers. AKTIESELSKAPET DRAMMENS ARMATUR-FABRIK. Norwegian 36,882, Feb. 26, 1923. A filter is placed in the cock for removing the solids when the liquid is sampled.

## 24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Rendering nitroglycerin insensitive to mechanical shocks by the addition of nitro aromatic compounds. P. R. DE WILDE. *Mon. sci.* 13, 121–4(1923).—It is well known that many aromatic nitro derivatives are sol. in  $\text{C}_2\text{H}_5(\text{NO}_2)_2$ . Several of these compds. have been used in admixt. in dynamites to lower the f. p. of the  $\text{C}_2\text{H}_5(\text{NO}_2)_2$  content. It has been observed that such mixts. had become less sensitive to explosion. It was found that where pure  $\text{C}_2\text{H}_5(\text{NO}_2)_2$  exploded from the blow of a 10-kg. hammer falling through 8 cm. it was necessary for the same hammer to fall through 30 cm. to cause the explosion of  $\text{C}_2\text{H}_5(\text{NO}_2)_2$  contg. 10% of liquid dinitrotoluene. deW. has tested this property by placing  $\text{C}_2\text{H}_5(\text{NO}_2)_2$  in which he has dissolved various known quantities of nitronaphthalene or dinitrotoluene or liquid trinitrotoluene, in glass tubes, and introducing into them, through a perforation in the cork, running fuse to which was attached a No. 8 tetrayl detonator. By firing these, supported in a mound of sand, it was found that 40% of the first, 50 of the 2nd and 55% of the 3rd before mentioned compds. were sufficient to prevent the detonation of the  $\text{C}_2\text{H}_5(\text{NO}_2)_2$  under these conditions, showing that the desensitizing capacity is the greater the less the number of  $\text{NO}_2$  groups in the nitro aromatic compd. used.

CHARLES E. MUNROE

The propagation of the explosion wave. I. Hydrogen and carbon monoxide mixtures. H. B. DIXON and N. S. WALLS. *J. Chem. Soc.* 123, 1025–37(1923).—A discussion of the reason for the slower rate of propagation of the explosion wave through  $\text{CO} + \text{O}$  mixt. as compared with that in  $\text{H}_2 + \text{O}$  mixt., noting the theories of Berthelot, Bone, R. V. Wheeler and his fellow workers. Certain errors in observations are due to faulty app. Temporary damping down of the explosion wave by "electrolytic firing" exists whether the  $\text{CO}$  is made explosive by small quantities of  $\text{H}$  or of steam. If it be true that pure  $\text{CO}$  and  $\text{O}$  do not combine with explosion because the product,  $\text{CO}_2$ , would be above the temp. at which it would be mainly dissociated, the same hypothesis might explain the discontinuity of the wave where the highly heated steam mols., formed in the "electrolytic" wave front, come into collision with the  $\text{CO}$  mixt. with its small  $\text{H}$ , or steam content. In this zone of rapid mol. motion the oxidation of the  $\text{CO}$  might be too slow to maintain the explosion wave, just as it is in the explosion of  $\text{CN}$  with twice its vol. of  $\text{O}$ , where the heated  $\text{CO}$  as it is formed in the wave front is inert towards  $\text{O}$ , but combines with it slowly behind the wave front. It would follow from this hypothesis that, as the  $\text{CO}$  is gradually replaced by more  $\text{H}$  in the mixed gases, the discontinuity should grow less and disappear; and at the other end of the scale where the  $\text{CO}$  detonating gas is fired with a great excess of electrolytic gas, the  $\text{CO}$  should act largely as an inert gas and retard the wave as such. Both these anticipations have

been verified; when 7.5% of the combustible gas was H, no discontinuity was found in the explosion wave, however, the mixt. was fired; when 7.5% of the combustible gas was CO, the latter had practically the same retarding effect as an equal vol. of N. Data are given for the explosion of mixts. of H and CO with O in defect, while rates of explosion wave and division of O in electrolytic gas diluted with CO, and also in CO-detonating gas dild. with H, are given.

CHARLES E. MUNROE

**Theory of the origin and spreading of sugar-dust explosions.** G. JARCKEL. *Z. Ver. deut. Zuckerind.* 73, 117-35 (1923); cf. *C. A.* 17, 2192.—Sugar-dust explosions may theoretically be caused by thermal ignition (direct heat or sparks), or by static electricity. Both theories are examd. critically. From the thermal constns. of sugar it is calcd. that the max. concn. of sugar dust at which explosion may occur is 7 kg., and the min. concn. 22 g. per m.<sup>3</sup>. Theoretical considerations show that ignition of a dust cloud by a spark is practically impossible, because it can occur only within very narrow concn. limits, of 236-300 g. per m.<sup>3</sup>. However, a cloud of sugar dust can become electrified by friction. If the potential elec. energy of the cloud exceeds the energy necessary for ignition, an explosion will take place. This condition is fulfilled when the elec. charge per g. equals  $10^3 \div \rho R \sqrt{2.42 + 2340\rho}$  electrostatic units, where  $\rho$  is the sugar concn. in g. per cm.<sup>3</sup>, and  $R$  the radius of a spherical dust cloud. This charge corresponds to 1 charged mol. per  $10^7$  mols., or 1-2 electrons per particle having a radius of  $10^{-3}$  cm. To prevent explosions, the size of dust-filled places and the dust concn. should be reduced as much as possible, and the formation of very fine dust avoided. The spreading of explosions is greatly enhanced by electrically charged dust, and an explosion wave may travel from one room to the next without a flame, but simply through compression of the dust cloud and a consequent elec. charge.

F. W. ZERBAN

**Genesis of technical sugar-dust explosions.** G. JARCKEL AND P. BEYERSDORFER. *Z. Ver. deut. Zuckerind.* 73, 136-57 (1923); cf. preceding abstract.—Expts. have shown that even under favorable conditions sparks do not start sugar-dust explosions; nor can heated machinery parts be responsible, as proved by theory and expt. When sugar dust is intimately mixed with O or N and blown under high pressure through a narrow slit, the mixt. does not ignite, in spite of the great elec. charge created; but it cannot be ignited either by a Pt wire heated to the m. p., and this expt. cannot therefore be used as an argument against the elec. ignition theory. Elec. measurements made in a pulverizing mill, and others in the lab., have shown that the elec. charges found are quite sufficient to furnish the necessary energy for igniting sugar dust. There remains no doubt that static electricity is the principal, if not the sole cause of sugar-dust explosions. Layers of dust only a fraction of a mm. in thickness on floors, walls, and ceilings are a potential source of great danger, in spreading an explosion or fire from its origin throughout adjoining rooms and buildings. The best means of avoiding explosions are: Proper selection of pulverizers, and a policy of not grinding too fine; the fine powders should be obtained by sepn. through sifting; flues for carrying off dust should be made as nearly vertical as possible. The best way to avoid trouble is wetting the dust. The parts of all machines and other equipment coming in contact with sugar dust should be connected to earth by metallic conductors, or their elec. charge neutralized in some way.

F. W. ZERBAN

**The explosion of an ammonia refrigerating machine in a margarine plant.** F. W. HOFFMANN. *Wärme & Kälte Tech.* 24, 280-1 (1922).—The explosion was caused by replenishing the machine from an O<sub>2</sub> cylinder by mistake.

ERNEST W. THIELE

**By-products in mercury fulminate manufacture.** R. C. MORAN. U. S. 1,459,410, June 19. The liquor contg. Et formate, Et nitrite and alc. obtained by condensing the vapors evolved in the ordinary manuf. of Hg fulminate is treated with a 30% NaOH soln. to saponify the Et formate while keeping the temp. below 20° (preferably about 15°) to avoid substantial hydrolysis of Et nitrite.

**Extinguishing explosions in mines.** H. KRUSKOPF. U. S. 1,459,677, June 19. Explosions in mines are avoided in firing shots in coal by introducing natural quartz dust into tubes or bags of paper or other easily destroyable material, inserting these filled tubes into the blast holes and securing other similar filled tubes in front of the holes.

## 25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Adsorbed moisture and water of crystallization in certain common dyes. H. WALES AND O. A. NELSON. *J. Am. Chem. Soc.* 45, 1657-66(1923).—Since adsorbed water is often held more firmly than the so-called water of hydration or crystal, it is not always possible to det. either by loss of wt. on beating. The object of this study was to det. whether the water present in the dyes was as adsorbed moisture or as water of crystal. The method used was that of detg. the vapor pressure after removing a small increment of water at const. temp. The app. was essentially the same as that described by Nelson and Hulett (cf. *C. A.* 14, 578). Vapor pressure-water content curves were obtained for methylene blue, crystal violet, erythrosin, magenta and tartrazin. Crystal violet and tartrazin alone showed hydrate formation. It was proved that the equiv. of 1 mol. of water in erythrosin is present as a part of the mol. and a new theory of the structure of this dye is offered.

L. W. RIGGS

Manufacture of brilliant yellow. H. HERLINGER. *Color Trade J.* 12, 142-3 (1923).—A formula and instructions are given.

CHAS. E. MULLIN

Dyeing raffia. CHAS. H. WALKER. *Textile Colorist* 45, 231-4(1923).—This basket material is dyed with acid, basic and natural dyestuffs from warm or boiling baths, according to the dyestuff used.

CHAS. E. MULLIN

Three types of black hosiery. W. C. DODSON. *Textile Colorist* 45, 355-9(1923).—Instructions are given for dyeing hosiery with S, direct and developed black. C. E. M.

Dyeing of direct blacks on cotton piece goods. RAFFAELLE SANSONE. *Am. Dyestuff Rep.* 12, 343-8, 451-6(1923); cf. *C. A.* 17, 2506.—These last two installments of this paper are devoted to the details of dyehouse procedure. Several dyeing machines and processes are described with illustrations, and their relative advantages are compared.

L. W. RIGGS

The application of color to leather. T. E. BRADBURY. *J. Soc. Dyers Colourists* 39, 107-15; *Am. Dyestuff Rep.* 12, 427-33, 477-8(1923).—A general discussion of some of the difficulties in leather dyeing is followed by information on the various types of dyeing equipment and their respective applications and advantages. Acid and basic, as well as direct and natural dyestuffs are used on vegetable-tanned leathers. The acid dyestuffs are applied with formic acid and sometimes  $\text{NH}_4\text{AcO}$  to aid penetration. Basic colors may be applied without a mordant but fuller and faster shades are obtained by the use of fixing agents such as  $\text{K}(\text{ShO})\text{C}_6\text{H}_4\text{O}_6$  or "titox" (potassium titanium oxalate) before dyeing.  $\text{FeSO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{CuSO}_4$  are used for bottoming and saddening basic dyestuffs. Chrome-tanned leathers may be dyed with acid, direct or mordant dyestuffs without mordanting. Basic dyestuffs are applied after mordanting with a tannin. Some natural dyestuffs contain sufficient tannin to act as a mordant for the basic dyes. The tannin mordant is usually fixed by a metallic salt before dyeing. Acid, basic and natural dyestuffs are used on alum-tanned leathers. The natural dyes are fixed by metallic salts. Oil-tanned leathers may be dyed with acid, basic, direct, natural, mordant or sulfide dyestuffs, the latter being most satisfactory. The sulfide dyes are applied by means of  $\text{Na}_2\text{S}$ , soap and  $\text{HCHO}$ . The skins are then washed with a soln. of  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $\text{CuSO}_4$  and  $\text{AcOH}$ . This is sometimes followed by topping with basic dyes. The mordant dyes are applied on a basic chrome alum mordant. The aldehyde leathers are sometimes dyed in a manner similar to oil-tanned chamois. Semi-chrome leather is dyed with acid or basic dyestuffs. The fastness properties of dyed leathers and fat liquors are discussed and some general information regarding certain dyestuffs is given.

CHAS. E. MULLIN

Sources of defects in the manufacture of pure wool blue piece goods. FRITZ MUNK. *Z. ges. Textilind.* 25, 183-4; *Chem. Zentr.* 1922, IV, 48.—Bright uniform streaks are due to irregular steaming, cloudy effects to Ca soap. Fe-rust causes small bright specks. Irregular boiling makes the edges brighter or darker than the middle. Data are given for useful dyes.

C. C. DAVIS

A standardized method for color measurement. H. S. BUSBY. *Textile World* 63, 1827-9(1923).—A method of color measurement, not readily abstracted, and a method of color comparison of dyed samples are described. In comparing the dyeings, the standard and unknown samples are fitted into a frame replacing the mirror of a DuBosc colorimeter from which the cups have been removed. By the use of gage standards of known variation in shade a rating is quickly obtained.

CHAS. E. MULLIN

Mercerization of vegetable fibers by nitric acid. P. P. BUDNIKOV. *Faserstoffe und Spinnpflanzen.* 5, 64-5(1923).—Vegetable fibers treated with 40-41°  $\text{Bé. HNO}_3$

at 10–15° gain in tensile strength up to 30 sec. immersion, but if the immersion is prolonged the strength of the fibers is reduced; after 12 min. immersion the strength is the same as it originally was. Further immersion leads to disintegration. The affinity for dyes increases as a result of the treatment and shows a max. point followed by a loss to less than the original. This max. is reached in 3 hrs. At 0° the effect on the strength is the same as at 10–15°, but the affinity for dyes is less enhanced. The fastness of substantive and sulfur dyes is greater on material mercerized with  $\text{HNO}_3$  than on the original. The product reduces Fehling soln.

E. R. CLARK

**Cottonizing flax tow.** S. G. SCHIMANSKY AND P. P. BUDNIKOV. *Faserstoffe und Spinnpflanzen* 5, 37–40(1923).—The  $\text{NaHSO}_3$  process of cottonizing flax tow was critically studied to det. conditions for prep. fiber which could be spun with min. addn. of cotton on cotton machinery. According to the recommended process, three small pressure kiers are used. In each, 1000 kg. of flax tow are placed. A lye contg. 8%  $\text{NaOH}$  and 1 1/2% of 38° Bé.  $\text{NaHSO}_3$  soln. (on wt. of fiber) is added to the first and the steam turned on until a pressure of 3 atm. is reached. The liquor is then fortified to the original strength and used in the second kier, and finally in the third. The next boiling requires but 1/2 as much  $\text{NaHSO}_3$  and  $\text{NaOH}$ , and is continued for 3 hrs. at 3 atm. Spent liquors are fortified and used twice more as before. Chemicals are then rinsed out and the process is completed by obvious operations. Yarns were spun contg. 62.5% of this cottonized flax, the balance being cotton. Naphthalenesulfonic acid +  $\text{NaOH}$ ,  $\text{EtOH}$  +  $\text{NaOH}$ , and  $\text{Na}_2\text{S}$  also are effective cottonizing agents. By evapn. of the spent liquor with  $\text{Na}_2\text{S}$  +  $\text{S}$ , and heating, a coloring matter sol. in  $\text{Na}_2\text{S}$  soln. was obtained. Cotton dyed in this soln. and chromed acquires a fast dark-brown shade.

E. R. CLARK

**Wool and cotton substitutes.** Cottonizing. E. O. RASSER. *Faserstoffe und Spinnpflanzen* 5, 13–7, 29–31(1923).—Flax and hemp tow, nettles, straw from seed flax and hemp, old linen rags, typha fibers, and jute are mentioned as sources of cotton substitutes particularly useful for the adulteration of wool. For this purpose in addition to mechanical treatment, "cottonizing" or splitting of fiber bundles into individual fibers similar to cotton, is necessary. Several processes are outlined. Jute is said to yield a satisfactory adulterant for wool by treatment with  $\text{NaOH}$ ,  $\text{Cl}$ , and  $\text{SO}_2$  successively. "Linolana" is the trade name of cottonized flax tow. "Plantawool" is a Swiss product made from jute.

E. R. CLARK

**Innovations in the manufacture of artificial fibers.** O. MÜLLER. *Faserstoffe und Spinnpflanzen* 5, 2–5, 17–9(1923).—An extensive summary of recent patents. The more important subdivisions are: Coagulating baths for viscose, the preparation of viscose, the pptn. of nitrocellulose and cellulose acetate solns., and the manuf. of artificial fibers for spinning.

E. R. CLARK

**The most important rules of viscose artificial silk manufacture.** ANON. *Textilber.* 4, 284–5(1923).—It is essential in making level dyeing viscose silk that strict uniformity be observed. According to the recommended process, the pulp in sheet form is dried at 35–45°. Even drying is considered essential to uniform action of the  $\text{NaOH}$ . After 2 1/4 hrs. immersion in 18%  $\text{NaOH}$  soln. at 18–19°, the excess alkali is removed by pressing, and the pulp disintegrated in a shredder for 2 1/2–3 hrs. The fine particles are then aged in a drum for 68–72 hrs. at 28–30°. It must be noted that ageing commences when the pulp enters the  $\text{NaOH}$  soln., and that higher temp. accelerates the ageing. For "sulfidizing" 30–32% of  $\text{CS}_2$  is used, the operation taking 2 1/2–3 hrs. at 24°, or until the last white particles disappear. The viscose soln. is made with the use of added alkali and contains 7% alkali and 8% cellulose. It is filtered and freed from air by storage in a vacuum vessel. Spinning baths of ample capacity should be used and the liquor in them kept in circulation. Uneven dyeing does not result from irregular wt. of the individual fibers if all the manufg. details are uniform. In the purification the individual lengths reeled should be less than 3000 m.

E. R. CLARK

**Cuprammonia solutions for the artificial silk industry.** R. LINKMEYER. *Faserstoffe und Spinnpflanzen* 5, 25–6(1923).—Comparison of the  $\text{Cu}$  and  $\text{NH}_3$  content of patented  $\text{CuO-NH}_3$  solns. of cellulose for spinning shows variations, based on 163 g. cellulose, from 40.8 g. to 197.0 g. for  $\text{Cu}$ , and from 172.8 g. to 988.0 g. for  $\text{NH}_3$ . The  $\text{Cu}$  variation follows from the fact that varying amounts of cryst. compds. are formed which are valueless for dissolving cellulose. Dehydration of freshly pptd. basic  $\text{Cu}$  salts may be checked by adding  $\text{Na}_2\text{CO}_3$  or better  $\text{NaHCO}_3$ . Adding sugar, alcohol, gums and nitrogenous substances also aids at this stage, and further leads to better luster in the product. Since less  $\text{NH}_3$  is required for the  $\text{CuO-NH}_3$ -cellulose compd. than for the soln. of the equiv. amt. of  $\text{Cu}$  in  $\text{NH}_3$ ,  $\text{NH}_3$  may be saved by carrying out the dissolving in stages. In prep. the basic  $\text{Cu}$  compd. low temp. favors high colloidal

content. Study of these principles will usually lead to economies in practical operations.

E. R. CLARK

**The preparation of flax fiber from straw in the pressure cooker.** G. RUSCHMANN. *Faserstoffe und Spinnpflanzen* 5, 50-3(1923).—High pressure cooking without chemical as a method of prep. flax fiber from the straw is greatly influenced by the substances which are discharged into the liquor. Of these the acids are especially important, as they bring about a hydrolysis of the pectins and weaken the fiber. Prior treatment with alkalies is just as important as in anaerobic retting. Hydrocarbons (cf. Peuffaillit, *C. A.* 7, 3422), added to the water are not effective. Green flax cannot be satisfactorily prep. for the high-pressure cooking by alkali treatment.

E. R. CLARK

**The chemical treatment of ramie.** W. C. HOLMES. *Color Trade J.* 12, 213-7 (1923).—The raw ramie is converted into "filasse" by the "degumming" process, which removes principally pectic cementing material. In the most successful process the first step is the removal of minerals, particularly the non-alkali metals by an acid treatment. Unless this acid or a similar treatment is given, these mineral constituents later combine with the pectic matter to form very insol. products, which it is impossible to wash out. The acid treatment is followed by washing and then by boiling in NaOH soln. to form Na pectate, which is sol. After washing to remove the pectate, the fiber is soured and given another wash to remove sol. pectic acid from the decompn. of any remaining pectates. With some varieties of ramie, such as "green hemp," a second NaOH and acid treatment is necessary in order to secure a sufficiently pure product. Although the cementing pectic material in ramie is similar to that in flax, removal by retting alone has not been satisfactory. Before milling, the filasse should be well conditioned and lubricated with a small amt. of vegetable oil. The gray product may be bleached to a brilliant white by permanganate, or by hypochlorite followed with peroxide.

CHAS. E. MULLIN

**Outline of general microscopic characteristics of vegetable textile fibers.** LOUIS SAVARON. *Color Trade J.* 12, 224-5(1923).—A very complete list of microchem. color reactions of the vegetable fibers with I-H<sub>2</sub>SO<sub>4</sub> reagent, as well as some data on reactions with other reagents.

CHAS. E. MULLIN

**Diffusion of dyes in gels (TRAUBE, SHIKATA) 2.** The relations between adsorption and dispersity of dyes (TRAUBE, SHIKATA) 2. Food colorings (RICHARDSON) 12.

AUSTIN, WM. E.: Principles and Practice of Fur Dressing and Dyeing. London: Library Press. 197 pp.

**Bleaching kier.** C. TAYLOR. U. S. 1,459,697, June 19. A hopper and inlet pipe for material to be bleached and for bleaching soln. are positioned at the top of the kier and a pipe withdraws soln. from beneath a perforated false bottom and returns it to the top of the kier.

## 26—PAINTS, VARNISHES AND RESINS

A. B. SABIN

**Lithopone. I. The mechanics of the chemical reaction in the darkening of zinc sulfide through the action of light.** E. MAASS AND R. KEMPF. *Z. anorg. Chem.* 36, 293-7(1923).—A critical review of various hypotheses heretofore advanced to explain the light darkening of lithopone. None of these is fully acceptable. The authors believe that it is due to formation of metallic Zn; a lithopone film darkened by light will cause deposition of more positive metals from weak solns.; the elec. cond. of ZnS is tremendously increased under the influence of light (*C. A.* 14, 3363). The liberated S probably combines loosely with some of the ZnS mols. remaining, to form a polysulfide. The roll played by H<sub>2</sub>O, whose presence is necessary to cause discoloration of lithopone by light, might be explained by the decompn. of H<sub>2</sub>O into H<sub>2</sub>O<sub>2</sub>, H<sub>2</sub> and O<sub>2</sub> by ultra-violet light, and the subsequent reduction of the ZnS by the nascent H. In this way H<sub>2</sub>O would act similarly to a developing agent on an exposed AgBr emulsion. HCHO formed from moisture and CO<sub>2</sub> of the air (cf. *C. A.* 4, 2408) might also help in the reduction of ZnS. The development of light sensitivity by calcination of ZnS, and its destruction through fine grinding in a mortar may be attributed to the transfer of electrons with subsequent changes in the lattice structure of the atom as found in the case of AgBr by Fajans and Frankenburger (*C. A.* 17, 1382) and Wilsey (*C. A.* 15,

3937) by X-ray analyses. That calcined ZnS possesses a cryst. structure is shown by photographs of the interference rings obtained on X-ray examn. The strongly sensitizing action of easily dissociated Zn salts on lithopone is no doubt similar to the greater sensitivity imparted to AgBr by adsorbed  $\text{AgNO}_3$ . The Zn ions of the salts are adsorbed by the S ions in the surface layer of the ZnS lattice and facilitate the transfer of electrons from the S to the Zn ion. The sepd. Zn, which causes darkening, would in this case be derived largely from the adsorbed Zn salts and not from the ZnS. This is in accordance with the adsorption rule of Paneth (*C. A.* 15, 2223). The bleaching of a darkened lithopone takes place only in the presence of  $\text{H}_2\text{O}$  or  $\text{CO}_2$ , and it appears to be due to formation of ZnO or basic  $\text{ZnCO}_3$  and not to a reversion of the Zn to ZnS. Successive darkenings are due to reduction of fresh portions of ZnS. (*Cf. C. A.* 17, 344.)

F. A. WERTZ  
Titanium pigments. E. O. RASSER. *Chem.-Ztg.* 47, 460-1(1923).—A review of the history, methods of production, and properties of Ti pigments. F. A. WERTZ

Synthetic resins as substitutes for amber and copals in the varnish industry. L. BEREND. *Z. angew. Chem.* 36, 242(1923).—Albertol resins have proved as satisfactory as natural resins for the production of oil and other varnishes. F. A. W.

The rosin and varnish industry in 1922. H. WOLFF. *Chem. Umschau* 30, 119-23, 129-33, 141-4(1923).—A critical review of recent work on the constitution, etc., of rosin, copal and their solvents, artificial resin, varnish and notes on lesser resins.

P. ESCHER  
New applications of phenol resins in the chemical and allied industries. L. V. REIDMAN. *Ind. Eng. Chem.* 15, 677(1923).—A summary of the most recent industrial uses of phenol resins.

C. C. DAVIS  
Economical japanning. R. D. COOK. *Fuels & Furnaces* 1, 171-2(1923).—A brief description of an economical installation for japanning. D. F. BROWN

Flexible varnish. C. D. DRAPER. U. S. 1,459,581, June 19. A flexible varnish adapted for use on textile fabrics is formed by mixing raw linseed oil with about an equal amt. of a waterproof varnish, *e. g.*, "Valspar" varnish.

## 27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

The colorimetry of fatty oils. WELWART. *Seifensieder Ztg.* 50, 251-2(1923).—W. cites some corrections by H. Heller (*C. A.* 17, 1343) to a reference in regard to the nature of color in oils and points out the existence of additional coloring matter in oils, such as lutein in corn, carotin in carrots, xanthophyll in autumn leaves, lycopin in tomato and fucoxanthin in brown algae. Strong alkali may produce a red color with chlorophyll under certain conditions and oxalic acid a brown color with chlorophyll.

P. ESCHER  
Halphen Test Committee (A.O.C.S.) report 1923. A. W. PUTLAND. *Cotton Oil Press* 6, No. 12, 50(1923).—The committee concludes from its work, details given, the Halphen test for cottonseed oil in other vegetable oils can be made the basis of a quant. test. [The A.O.C.S. later voted to drop this work as the majority felt the test could not be made quant. ABTRACTOR.] H. S. BAILEY

Bleach Test Committee (A.O.C.S.) report 1923. A. W. PUTLAND. *Cotton Oil Press* 6, No. 12, 51(1923).—Refined cottonseed oils were bleached by the official A.O.C.S. procedure but with variation of the percentage of fuller's earth used. Similar tests were made with 6% earth plus 0.2% of  $\text{CaCl}_2$ ,  $\text{NaCl}$ ,  $\text{CaSO}_4$ , and  $\text{Na}_2\text{SO}_4$  at 90° and 105°. No improvement was noted. It is recommended that no change be made in the present method except to specify that bleach tests be stirred at a speed of 250 r. p. m. for 5 min. H. S. BAILEY

Reports on coöperative oils nos. 5 and 6 of A.O.C.S. H. J. MORRISON. *Cotton Oil Press* 6, No. 12, 52; 7, No. 1, 85(1923).—Tabulations of % free fatty acid by brine and alc., refining losses, color and I no. of crude cottonseed oils analyzed by 35 chemists. Probably better agreement on refining losses could be obtained if the final temp. were 55° instead of 43°, as at present. H. S. BAILEY

Government factors on A.O.C.S. standard sodium carbonate and ammonium sulfate. H. S. BAILEY. *Cotton Oil Press* 6, No. 12, 53(1923).—The U. S. Bur. of Standards reports on 3 bottles of the A.O.C.S. standard  $\text{Na}_2\text{CO}_3$ , 99.91, 99.98 and 99.97%. The accepted value has been 99.93%  $\text{Na}_2\text{CO}_3$  and this will be continued. The U. S.

Bur. of Chemistry reports on the standard  $(\text{NH}_4)_2\text{SO}_4$  N = 21.09, 21.11 and 21.22% or an av.  $\text{NH}_3$  factor of 25.68. This is practically identical with the accepted value of 25.67%. H. S. BAILEY

Cottonseed Oil Refining Committee (A.O.C.S.) 1923 report. H. J. MORRISON. *Cotton Oil Press* 7, No. 1, 84(1923).—It is recommended that the official rule for making refining tests on crude cottonseed oil specify the size and shape of the cup and paddle and time and rate of stirring as follows: cup, 45 in. in diameter and 4 in. deep; paddle, T-shaped with blades 0.5 in. wide and 3.5 in. over all; agitation, 250 r. p. m.  $\pm 10$  throughout refining; time of stirring, 5 min. after addn. of NaOH soln. before application of heat, the temp. is then raised to 55° in as nearly 15 min. as possible. [These recommendations were made a part of the Interstate Cottonseed Crushers' Rules. ABSTRACTOR.] H. S. BAILEY

Sampling Committee (A.O.C.S.) 1923 report. P. W. TOMPKINS. *Cotton Oil Press* 7, No. 2, 34(1923).—A plea for the sampling of oil in tanks and cars by more competent individuals than at present often charged with such work. A new type of sampler which will take from a tank car a sample representative of the actual vol. at every depth was described during the discussion which followed the report. This consists of a mandrel smaller in the middle than at either end, which is first put down through the oil and a casing then slipped over it. The vol. of oil enclosed in the sampler between the casing and the core is at every point proportional to the vol. of a horizontal section cut from a horizontal cylinder of the dimensions for which the sampler is designed. H. S. BAILEY

Composition of the free fatty acids of cottonseed oil. G. S. JAMIESON. *Cotton Oil Press* 7, No. 2, 35-6(1923).—The hydrolysis of the glycerides of crude vegetable oils is probably due to enzymes present in the seeds from which they are derived. Splitting probably takes place concurrently in 3 stages so that tri-, di- and monoglycerides may be present at the same time. The free fatty acids of peanut and cottonseed oils were obtained by neutralizing the oils, dissolved in petroleum ether, with EtOH-KOH, and shaking out with EtOH, then liberating with HCl. These were carefully compared with the total fatty acids obtained from the same oils. Within the limits of exptl. error no difference was found. Tables showing I no., satd. and unsatd. acids, the I no. of the latter, and of the free fatty acids and total fatty acids are given. H. S. BAILEY

Ammonia Committee of the A.O.C.S. 1923 report. H. C. MOORE. *Cotton Oil Press* 7, No. 2, 36-7(1923).—Using 2 samples of cottonseed meal 25 collaborators detd.  $\text{NH}_3$  by the Kjeldahl method using  $\text{Na}_2\text{S}$  and  $\text{Na}_2\text{S}_2\text{O}_3$  to ppt. the Hg previous to distn. They also made the distn. with the Davison and regular traps. The results given in detail indicate there is no difference in the av. results obtained with sulfide and thiosulfate or with various types of traps. H. S. BAILEY

Catalytic splitting off of hydrogen. E. C. K. AND TH. ARENTZ. *Chem. Umschau* 30, 105-6(1923).—Polemical, regarding W. Normann's reported evolution of  $\text{H}_2$  during the hydrogenation of oils (*C. A.* 17, 1344). P. ESCHER

Producing olive oil in Mallorca. J. HERDEN. *Chem. Umschau* 30, 106-8(1923).—H. describes the primitive methods used on the island in pressing olive oil. P. ESCHER

A new occurrence of ceryl cerotate. A. BARENTHER. *Chem. Umschau* 30, 117-9(1923).—An isolated tank of sunflower oil, from the center of which oil was withdrawn while fresh oil (10 carloads) was pumped in on top, showed at the end of the season that the oil at the bottom became turbid and gelatinous at 30°. A careful sepn. and analysis of the turbidity proved it to be ceryl cerotate wax, to the amt. of 0.14% on the basis of the residual oil left in the tank, and its source was traced to the hulls of the sunflower seed, found to contain 10% of this wax. It is concluded that the wax sepd. from the oil during cold weather. P. ESCHER

Studies of the principles contained in plants with medicinal oils in South Italy and the colonies. Experiments on castor oil plant: A. PERATONER. *Boll. sci. tech. periodico bimestrale per gli A i del com. naz. sci-ten. svil. ppo e l'incremento dell'industrie ital.* 3, No. 2, 723; *Bull. Agr. Intelligence* 12, 1191-3(1922).—The seeds of 40 varieties of *Ricinus* were studied and the oil content was detd.; this varied from 51.5 to 56.5%. To det. the purity of com. oil the ricinolein content is detd. as follows: phosgene is bubbled through the oil at 100°; it reacts quant. giving a trichloro deriv. insol. in alc. and heavier than  $\text{H}_2\text{O}$ . This deriv. is sepd. from the dissolved phosgene by heating to 50-60° and the absorbed Cl detd. by the Piria-Volhard method. The amt. varies between 8.9 and 9.2%. E. SCHERUBEL

Super-deodorization and the neutralizing and bleaching of oils under vacuum. L. C. WHIRRON. *Cotton Oil Press* 7, No. 2, 30-2(1923).—The use of vacuum in the refining, and bleaching of vegetable oils offers an opportunity for improvement in

present methods. Deodorization at pressures lower than those commonly used gives better oils at a lower cost. The success of such processes depends largely on the design and capacity of the app. used. Details of the Bataille Process are given. The advantages of vacuum refining are: a more rapid settling of soap stock, less mechanical oil loss, less sapon. of neutral oil because less NaOH is required, and freedom from oxidation. The vacuum neutralized oil is "genuinely" neutral and free from any trace of dissolved soap. Bleaches under vacuum require only 50% as much fuller's earth as those made at atm. pressure and, therefore, the absorption loss is cut in half. In "Super-deodorization" the vol. of the steam is increased 6 times by increasing the vacuum from 28.5 to 29.7 in., and it is vol. not wt. of steam that removes the objectionable odors.

H. S. BAILEY

Cod liver oil industry in Newfoundland. S. S. ZILVA AND J. C. DRUMMOND. *J. Soc. Chem. Ind.* 42, 250-1T(1923).—A discussion. Cf. C. A. 17, 2369. E. SCHERUBEL

Marine animal oils. ÉMILE ANDRÉ. *Bull. soc. chim.* 33, 469-506(1923).—Part I discusses fatty acids and unsapon. matter of various marine oils and also the hydrocarbons of dog fish oil. Part II contains a discussion of the production and uses of marine animal oils.

E. SCHERUBEL

Sulfonating castor oil and its preparation for Turkey red oils. VINZENZ JELINEK. *Seifensieder Ztg.* 50, 183, 199(1923).—J. describes in detail a simple outfit and its operation for small-scale rapid production, using 600 kg. castor oil.

P. ESCHER

Sulfonation of oils in general and of fish oils in particular. POMERANG. *Chem. Umschau* 30, 133-4(1923).—The equations which are usually accepted as representing the chem. reactions during sulfonation are inadequate, since the products resulting from sulfonating castor oil are of colloidal nature, varying from Turkey red oil to "Monopol" soap, "Turkon" oil, etc., according to the physical conditions during sulfonation. Similarly the products of sulfonated oleic acid and still more of fish oils do not correspond to the usual equation on account of their double bonds. Colloidal reactions are not strictly stoichiometric but are of an absorption nature.

P. ESCHER

Cheap soaps and economy in washing compounds. O. SPANGENBERG. *Z. deut. Oel Fett-Ind.* 43, 274-5(1923); cf. C. A. 17, 2369.—An outline of small-scale prepn. of heavily filled cold-made soaps, with a recommendation to introduce liquid soaps contg. hexalin or methylhexalin, which increase their cleansing power beyond that of the best laundry soap.

P. ESCHER

Soap Stock Committee (A.O.C.S.) 1923 report. A. A. ROBINSON. *Cotton Oil Press* 7, 86(1923).—A tabulation of cotton oil soap stock analyses made by the method of the Fat Analysis Committee of A.C.S. Further work on unsapon. matter is urged.

H. S. BAILEY

"Secretol," a new fat-splitting substance. CARL GLÖSSL. *Seife* 7, 652-4; *Chem. Zentr.* 1922, IV, 71.—"Secretol" is equiv. in its fat-splitting action to similar substances such as Twitchell reagent. Equipment for a fat-splitting process is described with data on costs.

C. C. DAVIS

Solid potash soaps. J. LEIMDÖRFER. *Seifensieder Ztg.* 50, 193-4(1923).—Solid potash soaps can be made by salting out the boiled K soap by means of KOAc. They can also be made by the cold process by the following formulas: (I) 100 stearin, 48 KOH, 39° Bé. (II) 80 hardened fish oil, 20 coconut oil, 48 KOH, 39° Bé. (III) 70 tallow, 30 olive oil, 48 KOH, 39° Bé. (IV) 70 coconut oil, 30 tallow, 50 KOH, 39° Bé. (V) 75 hardened linseed oil, 25 sulfonated castor oil, 48 KOH, 39° Bé. These soaps are hard, of good touch and luster, excellent transparency and unexcelled lathering quality, but all are too hygroscopic, becoming soft and even liquid in 1-2 weeks. A soap by formula (III) absorbed 23.2% H<sub>2</sub>O after 288 hours in a moist atm. The soaps contg. most stearin keep longest.

P. ESCHER

Cyclohexanol soaps. J. H. FRYLENDER. *Rev. prod. chim.* 26, 362-4(1923).—Brief review of their properties, manuf. and uses in the textile industries.

A. PAPINEAU-COUTURE

Soft soap. V. SHIDL. *Seifensieder Ztg.* 50, 265-6(1923).—A description in detail of the customary practice of holling soft soap.

P. ESCHER

A new soap-drying apparatus. M. STAFFAN. *Seifensieder Ztg.* 50, 194-5(1923).—The liquid soap from the kettle is distributed upon two steam-heated drying rolls and leaves them in the form of strips or shreds; these fall upon two cooling rolls, from which toothed scrapers deliver them into a worm-conveyor. The advantage of the app. lies in the uniformly dried product.

P. ESCHER

Cod-liver oil (ANDRÉ) 17.



## 28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

A study of cane left standing two years. W. E. CROSS AND S. DELASCIO. *Rev. ind. agr. Tucumán* 11, 85-99(1920-1).—See C. A. 16, 4360. The cane referred to was grown in Tucumán, Argentina. L. B. GILSON

The deterioration of cut cane in Pampanga. H. A. LEE. *Sugar News* 4, 7-15 (1923).—A large plot of cane was divided into sections, one third topped, one third cut and one third cut and removed to a shed to protect the cane from the heat of the sun. The yields for the 3 systems show the advantage of using cane as soon as cut and the protection given by a shed in holding down evaporation and inversion. C. H. C.

Deterioration of hurnt cane. C. L. LOCIN. *Sugar News* 4, 239(1923).—Data show a loss in burnt cane of from 8.94% for cane milled 3 days after burning to 36.25% for cane milled 7 days after burning, based on av. values for unburnt cane. C. H. C.

Root rot in Java, particularly in connection with cane variety EK 28. J. KUYPER. *Arch. Suikerind.* 31, Mededeel. Proefstation Java-Suikerind. No. 4, 117-81(1923).—In 1921 this cane variety was badly attacked by root rot. A special investigation showed that the spread of the disease could not be ascribed to any particular factor, except that it was generally associated with anaerobic conditions in the soil. It was influenced by the height of the water level and the corresponding amt. of soil moisture. No particular organism has as yet been found to be the cause of root rot. There is no reason to suspect that EK 28 is deteriorating, and it still remains the variety giving the best results in many localities. F. W. ZERBAN

Invertase content of the leaves of the sugar beet and of the mangold. A. TRAEGEL. *Z. Ver. deut. Zuckerind.* 73, 158-62(1923).—The development of the root of the sugar beet, with its accumulation of sugar, and, in comparison, the absence of enlarged roots in the mangold may be connected with a lack of invertase in the leaves of the latter. To throw light on this question, the assimilating portions of the leaves of each plant were ground with twice their wt. of pure, ignited seas and the mixt. was added to a slightly acidulated 5% cane-sugar soln. The beet leaves caused 3 times as much inversion in a given time as the mangold leaves. This indicates a higher invertase content in beet leaves and makes it probable that the cane sugar formed in the leaves migrates to the root not as such, but as invert sugar, which is again transformed into cane sugar and stored. F. W. ZERBAN

Plantation granulated direct from the cane. O. F. BOYD. *Louisiana Planter* 70, 387-8(1923).—Higher yields in plantation granulated can be obtained by more careful attention to details of manuf. The mixed juices should be sulfured to 4.5-5.0 cc. 0.1 N acidity and limed back to 0.5-0.8 cc. The liming should be watched carefully. The juice is heated to 210-20° F. and settled. The clear juice if filtered gives improved yields. The mud should be resettled or sent directly to the presses. Before pressing the mud is limed to neutrality to phenolphthalein and Filter-Cel is added. The filtered juice must be treated with phosphoric acid before returning to the system. The juice after passing through the effects should be resulfured slightly. Reheating of the juice before it enters the pan is essential. After settling, the concd. juice is drawn into the pans as required. Good clarification will give few settlings but for high-grade sugars this settling is necessary. The foots should be removed and pressed. The sirup is boiled in the pans to 80-82 purity and grained to a small, hard and brilliant crystal. The run-off from the centrifuge is used for second boilings but the wash is used to top-off a first strike. The wash and run-off should be diluted with water to 35° Bé. and have the same temp. as the massecuite to which they are to be added. The purity of these will be about 78 and 58, resp. The amt. of run-offs used on the second boil is detd. by the purity of the run-offs from the massecuite being developed. This will be about 45 and these run-offs are boiled to string proof and stored in a hot room. Seconds or hot-room sugars give very dark solns. and should be resulfured, relimed and filtered with Filter-Cd before returning to the process. C. H. C.

The by-product process. ED. KUREK. *Z. Zuckerind. czechoslovak Rep.* 46, 308; *Chem. Zentr.* 1922, IV, 58.—The difficulties of the by-product process (cf. Hruša, C. A. 17, 1161) are overcome by the Pospisil process, and a by-product of 96% polarization is obtained. The process gives only 2.5% molasses with a purity quotient of 50-5. C. C. DAVIS

Notes on sugar manufacture in Java. I. Chemical part. A. SCHWEIZER. II. Electrical equipment. P. R. NISBOUR. III. Mechanical equipment. L. KOETZE.

*Arch. Suikerind.* 31, 441-63(1923).—Addresses describing the equipment and process used at the new Tjepiring factory, Java. F. W. Z.

**Clarification practice in Hawaii.** W. R. McALLEP. *Louisiana Planter* 70, 268-9 (1923).—The use of more lime in the clarification of Hawaiian juices has given better results in many instances. Most factories carried liming to litmus neutrality and found that liming to phenolphthalein neutrality gave results similar to those of overliming; larger ppts. are obtained by a more alk. clarification but judicious addition of enough lime will improve both quality and yield. Freer boiling in the pans is obtained. Liming at the press is conducive to overliming. Liming at the mills is reported unfavorably. It causes the soln. of gums and impurities that cause difficulties later in the process. Returning the settlings from the clarifiers and the mud from the presses gave a decrease in extrn. C. H. C.

**Clarification practice in Hawaii.** C. G. PETREE. *Louisiana Planter* 70, 287-9 (1923).—The return of mud from the settlers to the mills gives very poor results. A system of double defecation reduces the sucrose content of the mud low enough to permit its addition to the mills without affecting the extrn. or quality of mill juice. A decrease in the total juice returning to the mills from 10-25% to 5% or less is effected. Reports from factories using the Petree process indicate savings and better results. C. H. C.

**Clarifying cane sirup and remelt by filtration.** A. S. EISENBAST. *Facts About Sugar* 17, 10(1923).—Ninety % of the cane sugar refineries in the U. S. clarify cane sirup mechanically with Filter-Cel; this process would be an improvement over chemical defecation, both economically and from the standpoint of results, if used on all juices in raw or plantation white sugar house work. Expt. demonstrated its superiority to the common lime-sulfur treatment. T. SWANN HARDING

**Factors influencing the purity of the molasses-mother sirup.** G. SCHECKER. *Z. Ver. deut. Zuckerind.* 73, 269-73(1923); cf. *C. A.* 16, 657.—The molasses of the last campaign are characterized by high purity, due partly to high raffinose content and partly to a low ratio of organic non-sugar to ash (*O/A*) in the raw sugar. This is generally the case after rainy summers, while after hot, dry summers, and in southern countries, the *O/A* ratio is usually high. A table is given which proves that the yield of refined sugar is regulated not so much by the organic non-sugar in the raw sugar, but rather decidedly by its ash content, and also by the purity of the final molasses. The purity of the mother sirup is controlled principally by concn. and temp. It is advisable to det. these before centrifuging and to add water accordingly as calcd. from Claassen's table. F. W. ZERBAN

**Sugar losses during boiling.** G. SCHECKER. *Z. Ver. deut. Zuckerind.* 73, 266-8 (1923).—Opinions on the magnitude of these losses vary greatly. Exact expts., with very careful sampling, have shown that under normal conditions the purity of a masse-cuite, even low-grade, is within the limits of error of analysis the same as that of the sirup before concn. It is generally stated that pans with good circulation give smaller losses than those with poor circulation. But many do not consider that circulation is influenced more by the height of the masse-cuite in the pan than by other factors. If this height is excessive the steam hubbles cannot overcome the pressure of the column of masse-cuite, hoiling stops, and local overheating takes place, causing sugar losses. F. W. ZERBAN

**The concentration of the hydrogen ions and the liming of the mixed juice.** J. BROMBERG. *Sugar News* 4, 65-8(1923).—The principles underlying the use of indicators for detg. H-ion concn. are clearly presented. Attention is directed to the superiority of Bromocresol-purple and Phenol-red over litmus and phenolphthalein in adjusting the acidity of the mixed juice with lime. A  $p_H$  value of 6.8-7.0 is recommended. The prepn. of indicators and their use by the spot method are described. C. H. C.

**The recovery of potash from waste molasses.** R. R. HIND. *Sugar News* 4, 16-9 (1923).—Molasses may be directly incinerated, with or without bagasse. A furnace running 210 hrs. burned 140 tons of molasses. 11.15 tons of molasses gave 1 ton of ash of 27.74%  $K_2O$  content. An actual recovery of 49.73 lbs. of  $K_2O$  per ton of molasses was made. C. H. C.

**Utilization of bagasse fuel.** Z. KOGAN. *Louisiana Planter* 70, 349(1923); cf. *C. A.* 17, 2182.—The best usage with bagasse as a fuel requires a max. surface exposure to allow for rapid drying of the bagasse. The amount of bagasse on the grates should be sufficient to prevent too rapid a passage of air and the development of holes in the fire. C. H. C.

**The utilization of engine steam and evaporation in a raw ground sugar factory.** THEODOR HAYEK. *Z. Zuckerind. czechoslovak Rep.* 46, 331-4; *Chem. Zentr.* 1922,

IV, 58.—Means is described for utilizing the total exhaust steam for the evapn. of liquor. C. C. DAVIS

**Analysis of Hawaiian filter press cake.** S. S. PRICK. *Sugar News* 3, 66(1922).—Press cake contained N 1.7,  $P_2O_5$  8.49, and CaO 7.76%. Dry cake used as fertilizer is valued at \$14.30 per ton. Moist cake, which had molded very heavily, showed no loss in nitrogen content on standing one month. C. H. C.

**Prevention of deterioration of sugars.** E. W. KOPKE. *Sugar News* 3, 361-2 (1922).—For Philippine sugars which are exposed to high humidities over long periods of time a safety factor of 0.29 is essential. Sugars must be dried as rapidly as possible after the strike is drawn. Much better efficiency is obtained by drying the hot sugars. Sugars held in crystallizers keep well. Absolute cleanliness in all parts of the factory and particularly at the centrifugal station is necessary to avoid contamination of the sugar with yeasts and molds. C. H. C.

**New investigations of the precipitation of cuprous oxide from Fehling solution.** G. BRUHNS. *Zentr. Zuckerind.* 30, 1473-5; *Chem. Zentr.* 1923, II, 38-9.—The different results obtained in the detn. of invert sugar in the presence of raw sugar by the KI-KSCN method by Beyersdorfer (C. A. 16, 2728) and Kunz (C. A. 16, 352) on the one hand and B. on the other (C. A. 15, 3258) are due to the influence of extremely slight amts. of insol. material, such as dust. Sucrose solns. must always be filtered before reduction to prevent a decrease in the amt. of Cu pptd. For filtering, diatomaceous earth or alumina is recommended, and the use of pptn. reagents for clarifying is not advised. The greater reducing power of the filtered soln. over that not filtered is only apparent, for by addn. of talc, both solns. reduce equally. The addo. of talc is recommended in all cases to insure uniform boiling and prevent superheating. C. C. DAVIS

**Marking sugar of domestic production by addition of lithium salts.** A. HERZFELD AND G. DORFMÜLLER. *Z. Ver. deut. Zuckerind.* 73, 206-10(1923).—To discourage profiteering in the sale of domestic sugar in Germany, it was proposed to add small amts. of a Li compd. to all such sugar, so that it could be identified as to origin. No Li could be detected in the ash of numerous German sugar samples; foreign sugars were not examd., for lack of samples. In several series of expts.  $Li_2CO_3$  was added to sugar either in the form of a very fine powder and thoroughly mixed dry, or else the sugar was moistened with a soln. of the salt and the mixt. then dried at 30°. By spectroscopic examn. of the sugar itself 0.01%  $Li_2CO_3$  could be detected only with difficulty, and 0.001% not at all. But in the sulfated ash of 20 g. sugar as little as 0.00045% Li salt still gave a reaction. In the carbonated ash of 50 g. sugar, prepd. in an iron dish, 0.0000625% could be identified, but 0.0000312% only at times. The ash must not be heated too highly, to avoid fusion or volatilization of the Li. For practical purposes an addition of 0.000125% would be sufficient. But the thorough incorporation of this small amt. on a factory scale would be very difficult and costly. The necessity of examn. by an expert would also be a disadvantage. F. W. ZERBAN

**Palm sugar in Cambodia.** J. CARDOT. *Revue histoire nat. appl.* 3, I, 182-6(1922); *Bull. Agr. Intelligence* 13, 1510-1.—In March towards the end of the season, the crystallizable sugar forms almost immediately into glucose, and then molasses only can be obtained. The molasses is in strong request by the Chinese distillers, who make a kind of alc. from it which they mix with arrack. An analysis of the sugar made by Bertrand gave the following results: water (moisture) 2.6, saccharose (ordinary crystd. sugar) 89.2, inverted sugar 4.2, various org. matters 2.3, ash 1.6%. Distg. tests have given 51 l. of alc. per 100 kg. of sugar. The sugar is excellent, of an agreeable flavor and may be employed in making confectionery. H. G.

Sugar-dust explosions (JAECKEL) (JAECKEL, BEYERSDORFER) 24.

## 29—LEATHER AND GLUE

ALLEN ROGERS

**The nitrogen determination in leather.** HEINRICH ROSE. *Collegium* 1923, 93-4.—The following method is most satisfactory: Digest 0.6 g. leather, 3 g.  $K_2SO_4$  and 1 drop of Hg with 10 cc. of  $H_2SO_4$ , at first over a low flame and then over a higher flame until it boils gently. Digestion is complete in 20 min. although the liquid is light yellow. The time could not be shortened by the use of other materials. Digestion with (1) perhydrol, (2) perhydrol and Hg, (3)  $K_2SO_4$  and Hg, (4) perhydrol,  $K_2SO_4$  and Hg; and

(5)  $\text{Na}_2\text{O}_2$  and Hg each required about 20 min. The results all agreed well, except that there was a loss with  $\text{Na}_2\text{O}_2$ . I. D. CLARKE

The determination of nitrogen in leather. F. URTZ. *Ledertech. Rundschau* 14, 177-8(1922).—A rapid method for oxidizing hide or leather for the N detn. based on the work of Migault (cf. C. A. 4, 2275) is as follows: To 0.5-1.0 g. of the sample add 10 cc. concd.  $\text{H}_2\text{SO}_4$  and small portions of 30%  $\text{H}_2\text{O}_2$  until the liquid is colorless. Heat and continue the addn. of  $\text{H}_2\text{O}_2$  until the soln. is permanently decolorized. From 2 to 4 cc. of  $\text{H}_2\text{O}_2$  should be ample. I. D. C.

Uniform official methods of leather analysis. JALADE. *Cuir* 15, 270-8(1923).—The adoption of uniform international methods is advocated, and detns. requiring special consideration are discussed. H. B. MERRILL

From the yearly report of the German laboratory for the leather industry at Freiberg. ANON. *Ledertech. Rundschau* 15, 2(1923).—A tabulation of the analyses of the important tanning materials and tanning exts. analyzed during 1922. The tanning materials were analyzed by both the shake and filter methods; the results by the shake method were always from 0.7 to 5% lower. I. D. CLARKE

New views on judging the tanning value of one-hath chrome liquors. E. STIASNY. *Collegium* 1923, 95-101, 113-9.—A lecture in which the following factors, which may influence the tanning action of Cr liquors, are discussed: the concn., the series (green or violet) to which the Cr salt belongs, the basicity, the pptn. no. (no. of cc. of 0.1 N NaOH required to give a permanent turbidity with 10 cc. of the liquor), the presence of alkali salts, the presence of materials which can form complex compds. with the Cr, the acidity or H-ion concn., and the age of the liquor. The constitution of the basic Cr salts is discussed from the point of view of Werner's theory. The basicity, pptn. no. and acidity are related, but each can vary while the others remain const. Neutral salts decrease hydrolysis, raise the pptn. no., and, therefore, decrease the rate of tanning, and if used in the first liquors prevent drawn grain. I. D. CLARKE

A suggested new method for the disinfection of skins for anthrax. H. F. SMYTH AND R. F. PIKE. *Am. J. Hyg.* 3, 224-37(1923).—Since a method of disinfecting dry skins in bales was desired the following gases were tested:  $\text{Cl}_2$ ,  $\text{Br}_2$ ,  $\text{I}_2$ ,  $\text{COCl}_2$ ,  $\text{C}_2\text{H}_5\text{Cl}$ ,  $\text{CCl}_4$ ,  $\text{SO}_2$ ,  $\text{HCl}$  and  $\text{NH}_3$ . Wicks, previously dipped in anthrax cultures and dried, were suspended, with one end dipping in bouillon, under bell jars and a partial vacuum was applied. After a short time normal pressure was restored by admitting the gas to be tested. Several hrs. later the wick and bouillon were examd. for anthrax. Only  $\text{I}_2$ ,  $\text{COCl}_2$  and  $\text{HCl}$  were reliable and the latter two ruined the skins. Intermittent sterilization at 75-90° with culture periods in the presence of nutrient material was not at all effective. The  $\text{I}_2$  may be applied either in a gassing chamber heated to about 50° to prevent deposition of  $\text{I}_2$ , or in soln. in  $\text{H}_2\text{O}$  (+ NaI),  $\text{CCl}_4$  or  $\text{CCl}_4$ -gasoline mixt. Good results were obtained by agitating for 2 hrs. 1 part of skin with 9 parts of a 0.5%  $\text{I}_2$  soln. Goat skins disinfected by this method were tanned into satisfactory leather. I. D. CLARKE

Histology of animal skin. I. The existence of the hyaline layer. A. KÜNZEL. *Collegium* 1923, 119-33.—A criticism of previous work is given. A microscopical exam. was made of cow and goat skin, both limed and not limed. No layer between the epidermis and corium could be detected. K., therefore, concludes that a hyaline layer does not exist. The corium ends in a fine close network of connective fiber which forms the grain surface of the leather. The epidermis is held to the corium by protoplasm fibers which lock into the network. The hyaline layer cannot be traced to a coating of protoplasm, as this is entirely removed by liming. The degree of swelling influences the character of the grain surface; the greater the swelling, the rougher and duller the surface. The grain surface becomes smooth when the hair holes close. I. D. CLARKE

The chroming of formaldehyde leather. E. GRILICHES. *Ledertech. Rundschau* 14, 186-7(1923); cf. C. A. 17, 351.—Since the  $\text{HCHO}$ -treated hide used in the previous work was found to be slightly alk. the expt. was repeated, with washing of the hide in bisulfite before it was placed in the chrome liquor.  $\text{HCHO}$  did not change the quantity of chrome absorbed, and did not decrease the amt. of acid taken up. I. D. CLARKE

The examination of sumac. JOHANNES PARSSLER AND HERMANN SLUYTER. *Ledertech. Rundschau* 15, 9-11(1923).—Disagreement between the results of different labs. may be due to extg. the material to 1.5 l. instead of to 1 l. Samples were extd. to 1, 1.5 and 2 l. and the exts. analyzed. The % of sol. solids and of tannin were greater the greater the vol. of the ext. but the nontannin was slightly lower and the increase in tannin is therefore only an apparent increase. The second l. of ext. gave no test or only a very slight one for tannin with Fe alum and with gelatin-salt, which shows

that the extn. by the first l. was complete. The official method must be strictly adhered to.

The examination of sumac. MARTIN AUERBACH. *Ledertech. Rundschau* 15, 25-6(1923); cf. preceding abstr.—The Koch extractor is not satisfactory; it often stops up; it does not give results which can be used by commercial ext. makers; and the extn., if carried only to one l., is not complete. The additional material, which is found by extg. to a greater vol. than 1 l. and which is absorbed by hide powder, must be considered as true tannin until shown to be otherwise.

The manufacture of wood extract. J. A. REAVHILL. *J. Soc. Chem. Ind.* 42, 246-50T (1923).—A review of the important methods of tannin extn. Conversion of liquid ext. to solid may be effected under vacuum or by the Kestner evaporator, which works without a vacuum. The latter plant consists of a feed pump with heater and evaporator. Heat is developed sep. from the evaporator to insure complete functioning of the latter. The liquor travels at a high speed in the form of a film and the water content is reduced to 8-15% according to the class of ext. treated. This evaporator obtains the same results as the pan with  $1/2$ - $1/4$  the heating surface with no mech. agitator within, and with very simple construction. When quick cooling or packing, a cool extractor may be applied. This extractor consists of a hopper feeding the liquor into the main body of the extractor. The main body is cylindrical and contains a screw sometimes water jacketed. The barrel is water jacketed. Crystal ext. is produced in a vacuum dryer of the single drum type. Several illustrations are included.

I. D. CLARKE

I. D. CLARKE

W. H. BOYNTON

The application of color to leather (BRADBURY) 25.

Blood-albumin glue. A. C. LINDAUER. U. S. 1,459,541, June 19. A glue which can be cold pressed is formed of dry blood albumin 100,  $H_2O$  200,  $NH_4OH$  5.5 and a polymer of formaldehyde 15 parts.

### 30—RUBBER AND ALLIED SUBSTANCES

JOHN B. TUTTLE

The use of brown acetic acid containing paraffin, in the coagulation of rubber. W. SPOON. *Arch. Rubbercultuur Nederland. Ind.* 7, 89-93(1923).—The paraffin content of the impure  $AcOH$  in question was too small to have any detrimental influences. Adding 1-2% paraffin to the rubber causes deterioration in properties.

R. BEUTNER

Investigations on the rate of drying of rubber. O. DE VRIES. *Arch. Rubbercultuur* 7, 95-123(1923).—The rate of drying may be increased by keeping the freshly rolled sheet in alc. or dil. formalin (1:10 or 1:100). Keeping in 10%  $AcOH$  or 5% alum soln. slightly decreases the time of drying but this may be ascribed to a loss of wt. by contraction. The rate of drying is decreased by keeping in water; storage for 1 week in water gives a very slowly drying rubber, sheets of ordinary thickness taking  $1\frac{1}{2}$ -2 months to dry in the air. The rate of drying is somewhat decreased by keeping in 1%  $AcOH$ , 5%  $Na_2SO_4$ , 1% quinosol or 1%  $Na_2CO_3$ . Keeping the freshly rolled coagulum in a moist atm. retards the drying, while keeping in illuminating gas or in  $CO_2$  increases the same. Adding formalin to the latter makes it so that keeping it in water retards drying very much. Coagulum that has been made slow-drying by keeping in water dries more quickly after being treated by alc.; dil. formalin,  $AcOH$  or 5% alum has no such action. During the keeping in the solns. described above, the coagulum loses 10-15% in wt. *The hygroscopicity of the rubber*—which is due to hygroscopic serum substances or to substances formed during the prepn.—influences the content of moisture of the air-dry rubber, but not the rate of drying. In fact, the slowest drying rubber is obtained by keeping it for a long time in water, by which treatment the hygroscopic substances are removed. The cause of the slow drying is to be looked for in changes in the structure of the coagulum.

R. BEUTNER

Preservation of latex with ammonia. O. DE VRIES. *Arch. Rubbercultuur* 7, 169-98(1923).—Latex kept in the lab. in tightly stoppered bottles remained in perfect condition for a year after the addn. of 20 cc.  $NH_3$  (sp. gr. 0.9327) per l. of latex. Adding 15 cc. proved sufficient in 8 cases out of 9; adding still less proved unsatisfactory. To control a preserved latex by titration, phenolphthalein should not be used as indicator but methyl red. The latex contains buffer substances, e. g., phosphates. Latex preserved with  $NH_3$  shows a decrease of alk. on keeping, which is the slower the higher

the dose of  $\text{NH}_3$  added; at a dose of 0.25–0.3%  $\text{NH}_3$ , the decrease becomes very low. Good preservation is reached only with addn. of 0.5%  $\text{NH}_3$ , which means a methyl red titer of 0.25  $N$ . After addn. of  $\text{NH}_3$  to the latex, a slightly yellow ppt. is formed, consisting of  $\text{NH}_4\text{MgPO}_4$  and rubber. Besides that a heavy dark brown ppt. is formed, consisting of  $\text{FeS}$ . When ammoniated latex is kept in bottles a creamy layer is formed, consisting of rubber globules showing lively Brownian movement. With methyl red the creamy layer gives a lower titer than the liquid underneath. Changes in the coagulation phenomena occur, also, in the ammoniated latex. Fresh ammoniated latex coagulates slowly, after addn. of acid, in the same way as non-ammoniated fresh latex. Ammoniated latex, a month old, coagulates rapidly, and in fine flocks which do not easily unite with the clot. Special methods of coagulation—to be described later—have to be resorted to.

R. BRUTNER

**The ash of rubber and its significance.** ALEXANDER BRUCE. *Tropical Agr.* 59, 267–8(1922).—About 0.5% ash was obtained from the latex of rubber from *Hevea*. The predominating constituents were  $\text{K}_2\text{O}$  and  $\text{P}_2\text{O}_5$ . The following analyses were obtained from the ash of rubber latex, crepe, and sheet.

	Latex. %	Crepe. %	Sheet. %		Latex. %	Crepe. %	Sheet. %
$\text{CaO}$	8.7	16.4	11.4	$\text{P}_2\text{O}_5$	24.0	43.0	42.2
$\text{MgO}$	5.8	6.2	7.6	$\text{SO}_3$	2.8	1.4	1.8
$\text{K}_2\text{O}$	43.0	23.4	26.4	$\text{SiO}_2$	2.6	—	—
$\text{Na}_2\text{O}$	12.4	8.9	6.8	$\text{Cl, CO}_2, \text{Fe, etc.}$	0.7	0.7	3.6

A discussion is given of the significance of the various elements in the development of the rubber plant.

M. S. ANDERSON

**Reactions of accelerators during vulcanization. V. Dithiocarbamates, thiuram disulfides and the action of hydrogen sulfide.** C. W. BEDFORD AND HAROLD GRAY. *Ind. Eng. Chem.* 15, 720–4(1923).— $\text{H}_2\text{S}$  is formed during vulcanization by the action of S on some constituent of rubber other than the hydrocarbon, and the reaction is accelerated by heat.  $\text{H}_2\text{S}$  in turn decomposes any metallic dithiocarbamates present and thus retards curing. The metallic dithiocarbamates may be regenerated by the action of metallic oxides on free dithiocarbamic acid at ordinary temp. Metallic oxides react with  $\text{H}_2\text{S}$  to form sulfides and hydrosulfides, thus protecting the dithiocarbamates from decompn. The shifting of the dithiocarbamic acid from 1 metal to another is due to the intervening action of the  $\text{H}_2\text{S}$ . Metallic hydrosulfides react with phenyl mustard oil and tetramethylthiuram disulfide to form metallic dithiocarbamates. In general the use of a metallic dithiocarbamate with the oxide of a different metal gives results similar to the dithiocarbamate of the metal of the oxide (Pb dithiocarbamates are exceptions). Pb dithiocarbamates, if protected by  $\text{ZnO}$ , will accelerate vulcanization without decompn. to  $\text{PbS}$ . Zn dithiocarbamates accelerate either at low or at high temps., and air-cure most rapidly with  $\text{Ca(OH)}_2$  or  $\text{MgO}$ , more slowly with  $\text{ZnO}$  and not at all with  $\text{PbO}$ . At higher temps.  $\text{Ca(OH)}_2$  and  $\text{MgO}$  become ineffective. Pb dithiocarbamates act only at relatively high temps., but in the presence of  $\text{Ca(OH)}_2$  or  $\text{MgO}$  air-cure slowly. Mg and Ca dithiocarbamates air-cure more rapidly than the Zn salts, but are less active at higher temps.  $\text{NH}_3$  and other amines form addn. products with Zn dithiocarbamates and accelerate vulcanization.  $\text{NH}_3$  changes thiuram disulfides to dithiocarbamates and thioureas and accelerates air-curing in the presence of  $\text{ZnO}$ .  $\text{H}_2\text{S}$  also changes thiuram disulfides to dithiocarbamates (cf. C. A. 16, 855), particularly in the presence of metallic oxides. No evidence is presented disproving the theory that metallic dithiocarbamates are true accelerators which activate S by the formation of polysulfides whose S is capable of vulcanizing at a low temp.

C. C. DAVIS

**The effect of litharge on accelerators of vulcanization.** P. L. BRAN. *India Rubber J.* 64, 1061–2(1922).—The addn. of a small amt. of  $\text{PbO}$  to mixts. contg. piperidine piperidylidithiocarbamate prevents premature vulcanization, but at the same time does not appreciably prolong the time of cure. The effect of  $\text{PbO}$  on this accelerator is apparently to retard vulcanization at the beginning, without influencing the subsequent activity of the accelerator.

C. C. DAVIS

**Vulcanization of rubber.** H. P. STEVENS. *Rubber Age* (London) 4, 87–94, 127–34 (1923).—A review.

C. R. P.

**Practical value of products of dry distillation of scrap rubber.** A. VAN ROSSEEM AND P. DEKKER. *Chem. Weekblad* 20, 78–82(1923).—Two samples of products of dry distn. of scrap rubber, prepd. in the Dutch Indies, are examd. as to their fitness as substitutes for turpentine oil; both are found to be valueless. The fractions distg. under

200°, however, which are  $\frac{1}{2}$  of the total, can be used as substitutes for turpentine, the phys. consts., the volatility, and the power of dissolving resins and rubber being the same.

R. BRUNNER

**Rubber composition.** W. FELDENEHIMER, W. W. FLOWMAN and P. SCHIDROWITZ. U. S. 1,458,693, June 12. Clay and Na oleate or a similar saponaceous material are incorporated in a dry state in rubber compns. to form a vulcanizable rubber of good strength and distensibility.

**Rubber packing composition.** MATSUJIRO TORII. Japan. 41,474, Jan. 24, 1922. One surface of a band of raw rubber is covered with a powdered alloy (of 40% Sn, 30% Pb, and 30% Sb) and the other with scaly graphite and then a paste of asbestos. After vulcanizing, the band is rolled in a vortex-form and pressed. The packing is suitable for steam turbines, etc.

**Vulcanizing rubber.** R. P. ROSE. Can. 231,086, May 15, 1923. C activated by heat treatment at 1000° for 90 mins. is added to rubber and the mixt. vulcanized. Cf. C. A. 17, 482.

**Rubber.** P. SCHIDROWITZ. Can. 231,059, May 15, 1923. An uncoagulated rubber contg. material in an alk. condition is subjected to vulcanization.

